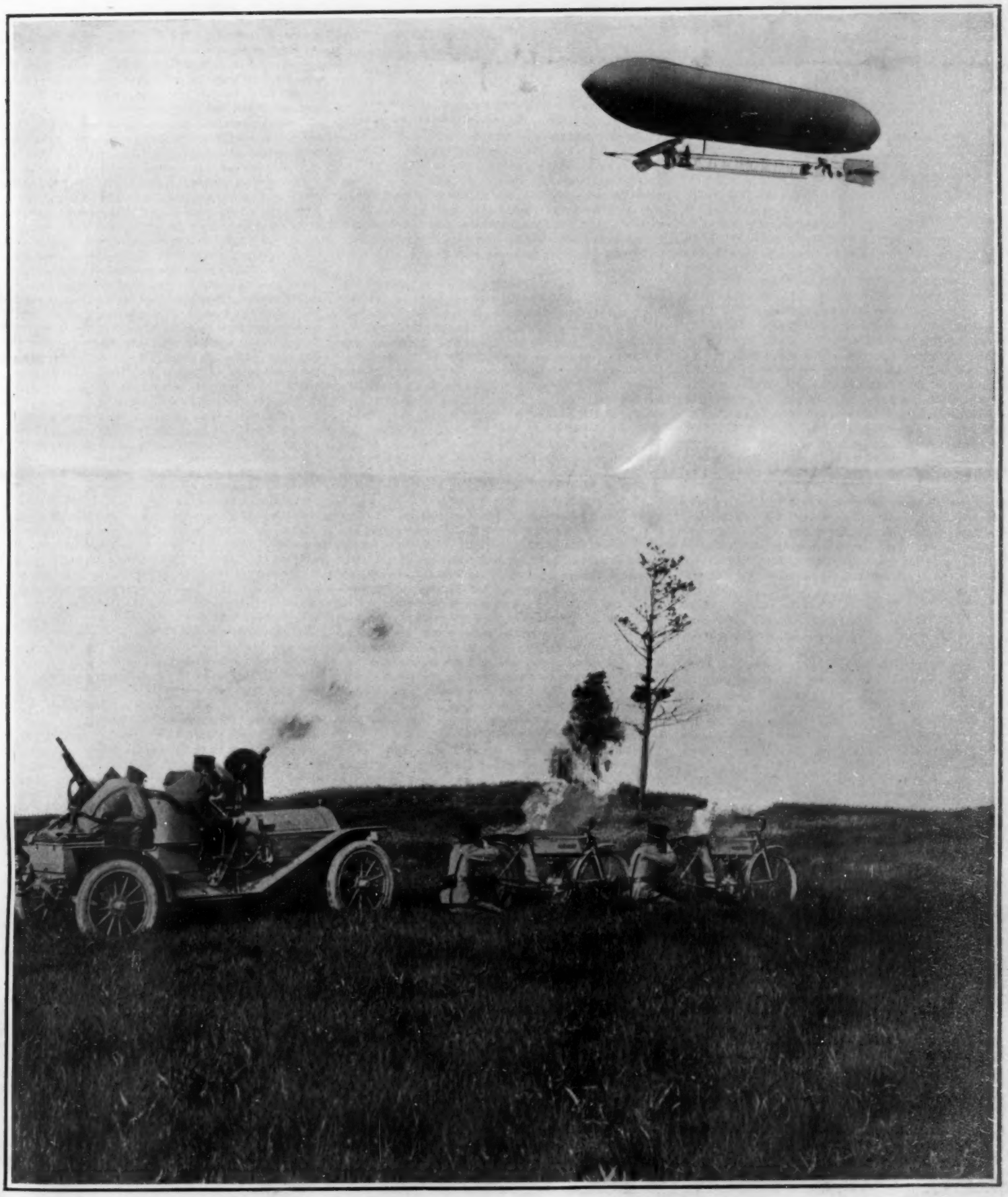
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1910, by Munn & Co., Inc.]

A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

Vol. CIII. No. 5. ESTABLISHED 1845.] NEW YORK, JULY 30, 1910. [10 CENTS A COPY. $3.00 A YEAR.



THE MILITARY AUTOMOBILE OUTFIT FOR ATTACKING AIRSHIPS USED DURING THE GLIDDEN TOUR.—[See page 81.]

SCIENTIFIC AMERICAN
ESTABLISHED 1845

MUNN & CO., Inc., - Editors and Proprietors

Published Weekly at
No. 361 Broadway, New York

CHARLES ALLEN MUNN, *President*
361 Broadway, New York

FREDERICK CONVERSE BEACH, *Secy and Treas*
361 Broadway, New York

TERMS TO SUBSCRIBERS.

Subscription one year..... $3.00
Postage prepaid in United States and possessions Mexico, Cuba and Panama.
Postage to Foreign countries..... $1.20 per year extra.
Canadian postage..... .75 per year extra.

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (established 1845)..... $3.00 a year
Scientific American Supplement (established 1876)..... 5.00 "
American Homes and Gardens..... 3.00 "

The combined subscription rates and rates to foreign countries, including Canada, will be furnished upon application.
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., Inc., 361 Broadway, New York.

NEW YORK, SATURDAY, JULY 30th, 1910.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THE CHICAGO-NEW YORK AND ST. LOUIS-NEW YORK RACES.

THE start of the long-distance race from Chicago to New York for a prize of $25,000 offered by the New York Times and the Chicago Evening Post has been set for October 8. Contestants are allowed one week in which to make the flight. They may stop when and where they will, no restrictions being put upon the length of the continuous flights, which may be as short or as long as the inclination or ability of the contestant determines. In all probability, the aviators will choose to follow the route of the New York Central lines, which is 960 miles in length. The advantage of this route is that it is level; that the tracks serve as a guide to the course; and that by keeping to the railway, the contestants will always be within easy reach of a town or village where they may get gasoline supplies and assistance in making repairs.

If this route be followed, it will be necessary for the winner to cover an average of 137 miles per day, which, unless most unusual weather conditions prevail, is a feat well within the ability of a well-found aeroplane. One of the most prominent among the entrants has expressed his conviction that in still air and barring serious breakdowns, he will make the distance easily in three days.

The New York World has offered a prize of $30,000 for the first flight from St. Louis to New York or New York to St. Louis, which is made between August 15 and December 31 in 100 consecutive hours. The contestants must give three days' notice to the New York World. Contestants must use the same machine throughout, which is the only condition placed upon them. The pilots may make as many stops as they like, so long as they complete the flight within the stipulated time of one hundred hours. Performances will be verified by the National Council of the Aero Club of America.

We note that both the New York Times and New York World applied for and obtained a sanction for the race from the National Council of the Aero Club of America, which is the governing aeronautical body in this country. As a consequence of this, the records made by various contestants for speed, distance covered without stops, mileage, etc., will be duly timed, chronicled and accepted the world over as official records. In this connection, we wish to draw attention to the fact that contestants for these races have an opportunity to win at the same time the SCIENTIFIC AMERICAN trophy for the longest continuous flight during the year 1910. The only formality that is necessary is that the entrant send a letter to the Aero Club of America, giving official notice that he is making this long-distance flight on October 8. By the rules of the contest, the Aero Club of America cannot recognize the contestant in the Chicago Times race as a contestant also for the SCIENTIFIC AMERICAN trophy unless an official notification that the contestants wish to try for the trophy is sent to them by the individual entrants.

When the race has been run and the $25,000 prize awarded, the Contest Committee of the Aero Club will compare the records of continuous flights made by those aviators who have notified the Club that they wish to try also for the trophy, and if one of these be found to have made the longest continuous flight of the year he will, should his distance remain unbeaten up to December 31st, be the holder of the trophy for 1910.

THE 12-INCH GUN CATASTROPHE AT FORT MONROE.

THE shocking accident at Fort Monroe, in which over a dozen men were killed by the premature discharge, during target practice, of a 12-inch gun, is one of the most fatal accidents of its kind on record. The gun was a modern breech-loader, mounted on a disappearing carriage of the Buffington-Crozier type, and at the time of the accident it was in the loading position, below the parapet. The shell, weighing 1,000 pounds, had been rammed home; the charge of between three and four hundred pounds of smokeless powder had been loaded into the powder-chamber back of the projectile; and the breech-block had been swung, door-like, into place on its hinges, but apparently had not yet been locked—when the charge became accidentally ignited. Just how this occurred will probably never be known. Most of the poor fellows who were clustered to the rear of the gun, and who were immediately concerned in the manipulation of the breech-block, having been blown out of existence. The ignition of the charge instantly liberated, in the form of flaming gases, an amount of energy capable of developing between 40,000 and 50,000 tons in the projectile; which, tearing the unlocked breech-block off its hinges, rushed to the rear in a mass of white-hot flame.

The peril of the breech block is part of the price which we pay for the immense superiority of the breech-loading over the muzzle-loading gun. Properly constructed, carefully operated, and provided with the very efficient checking devices designed to absolutely preclude the possibility of the gun being fired before the block has been screwed into position, there is no greater risk to the gun detachment from a breech-loading than there is from a muzzle-loading gun—except in respect of that very grave peril known as a flareback.

A flareback is due to the ignition of unconsumed powder gases, which may have remained in the gun from the previous discharge. It is liable to occur on the opening of the breech-block, when, fresh air rushing into the gun, supplies the necessary oxygen for combustion. Flarebacks, however, may be prevented by introducing an air blast into the powder chamber through suitable ducts and blowing the combustible gases entirely out of the gun. This method is used on all the big guns of the United States Navy, and it has been found to be very effective. Whether this 12-inch gun at Fort Monroe was so fitted we do not know. It is, of course, possible that the explosion was due to some burning material which remained in the gun from a previous discharge, and which, before the breech was locked, ignited the charge.

The frightful nature of this catastrophe will draw attention to the absolute necessity for so arranging the firing mechanism, that it will be entirely cut off or disconnected until the moment when the breech-block has been rotated sufficiently to bring the engaging threads completely home and lock it securely in place. If the guns are fired electrically, it is obvious that a make-and-break arrangement of this kind may be easily applied. Until recently, however, the guns of our fortifications were fired by the lanyard and it is possible that this was the case with the gun in question. If so, it can easily be understood that through accident, or in the excitement of the sham attack which we understand was taking place, the lanyard might have been pulled taut prematurely, or there may have been a premature command to fire.

Cleaning out the bore by the air blast and the use of the most approved methods of safety electrical firing should absolutely preclude the recurrence of such a deplorable disaster as this at Fort Monroe, the details of the official report upon which will be awaited with the keenest anxiety.

LESSONS OF A MONORAIL CAR ACCIDENT.

WHEN an accident, such as that which happened the other day on the first trip of the monorail car over the City Island track in this city occurs, it is well to look at all the facts carefully before condemning the system as a whole. In the present case, the overturning of the car seems to have been due entirely to faulty construction in one of the details, and the carelessness to have been of just that very kind which will wreck any system, however good it may inherently be.

The monorail problem seems to be one of those which we shall have always with us. On the face of it, the idea is certainly attractive; for why, it is asked, should we go to the expense of laying down two expensive lines of rail, if one will suffice? It would look as though there were large economies to be gained by the elimination of this superfluous rail. And so, indeed, there would be were it possible to remove the rail and substitute nothing in its place. But this we cannot do. The removal of the second rail (necessary in case of the standard track for equilibrium) makes it imperative in any form of monorail to substitute some other supporting or stabilizing member, whose construction and maintenance may easily equal, if not surpass, the expense of the rail so removed.

Among the many types of monorail may be mentioned the celebrated system running at Elberfeld, Germany, in which the cars are underhung from a monorail which is carried on an expensive overhead construction. Then there is the Behr type, in which the cars run on a rail at the top of a saddle-like construction, and are provided with lateral wheels which bear against steadying rails running parallel with and below the carrying rail. In each of these cases the cost of construction is as great or greater than that of a standard two-rail track laid on the surface.

One of the latest and most ingenious systems is that invented by Brennan and developed also by Scherl, in which a single-surface track is used, and the car is maintained in equilibrium by gyroscopes carried upon the car. Here, although there is some economy in track construction (though not very much, since the heavier concentration of wheel loads and the higher speeds proposed will call for heavier track construction) the complete system must be more expensive on account of the very costly character of the gyroscopic mechanism with which every car on a train must be equipped.

The latest monorail system to be put to practical test was recently installed on a short branch line running from Barton on the New Haven Railroad to City Island. A single rail is laid on the surface and equilibrium is maintained by means of an overhead rail carried on standards attached at the side of the track which serves to engage an overhead trolley. This trolley holds the car in a vertical position and also serves as the contact feeder for carrying the current to the motors. It will be evident that when the car is running on a straight track, and if the overhead rail be exactly vertical above the surface rail, there would be no lateral strain on the overhead rail other than is occasioned by the tendency of the car to oscillation; but that when curves are reached centrifugal force comes into play, and the overhead rail must be moved to the inside of the curve until a position is reached in which the inward lateral component of gravity equilibriates the outward lateral pull of centrifugal force. In this position, also, there will be no strain on the upper rail other than that due to oscillation, provided the speed of the car be always exactly that for which the upper rail is adjusted. Should the speed exceed this there will be a stress tending to pull the overhead rail and its supports to the outside of the curve; should the speed fall below the designed speed the stress will be toward the inside of the curve. This last condition appears to have been the one that obtained in the recent accident; when the load of the car proved sufficient to pull up the overhead rail support from its foundation fastenings, which seemed to have been altogether inadequate for their duty.

The City Island monorail line was built under the sanction of the Public Service Commission of this city, and we trust that in the interests of engineering it will be allowed to have a second trial to determine what good points it may have before steps are taken for its removal, if they ever should be. Indications are that the overhead rail and its supports stand in need of thorough reconstruction, at least on the curves. Should this be done we see no reason why the system should not be put to a most thorough test to prove what merit, if any, it may have in this particular service in an ordinary two-track system.

THE AGE OF THE EARTH.

During many years there was a disagreement between geologists and physicists in regard to the geological age of the earth, which the geologists estimated to be at least 300 million years, while the physicists deduced, principally from thermodynamic considerations, the comparatively short age of 20 or 30 million years. Through the study of radioactivity this old controversy seems now to have been decided in favor of the geologists. Some time ago Strutt deduced, from the proportion of helium found in thorium ores, a lower limit of 240 million years for the age of the earth. The same physicist has recently attempted to determine, by direct experiment, the rate at which helium is generated in thorianite and pitchblende. He found that the quantity of helium produced by 400 grammes of thorianite in 7 weeks was certainly less than 2×10^{-8} cubic centimeters. From this it follows that one gramme of thorianite generates less than 3.7×10^{-6} cubic centimeters of helium per year. Hence at least 240 million years must be allowed for the accumulation of the 9 cubic centimeters of helium which are actually found in each gramme of freshly mined thorianite. The experiments with pitchblende gave a value for the rate of production of helium which is of the same order of magnitude as the value calculated by Rutherford, but as the results are not regarded as absolutely certain experiments on a larger scale have been commenced. At all events the geologists' estimates of the age of the earth appear to be much nearer the truth than the estimates formerly made by physicists.

The Japanese Government has ordered four military airships in France. They are expected to be delivered late in August.

ENGINEERING.

The Canadian Government has dispatched a schooner to Hudson Bay, where she will survey the approaches to Nelson River, locate the most available harbor channel, and report upon the feasibility of the Hudson Bay route for the shipment of wheat from the West in connection with the proposed railroad from Hudson Bay to Winnipeg.

The Bureau of Construction and Repair of the Navy reports that on July 1st the battleship "Florida" was 68.80 per cent completed, and the sister ship "Utah" 80 per cent. On the same date, the "Wyoming" was 28.40 per cent, and the sister ship "Arkansas" 34.60 per cent completed. On the large colliers, "Cyclops" and "No. 8," the degree of completion was respectively 79.30 and 34.90 per cent.

During a discussion of Chicago's smoke problem before the Western Society of Engineers, Mr. A. J. Saxe made some telling illustrations of the necessity for sufficient air supply if perfect combustion is to be assured. He used some homely illustrations with an ordinary kerosene domestic hand lamp, one of which went to prove the important fact that all boiler furnaces should have a combustion chamber, or its equivalent, between the grate and the heating surface. In many boilers, the gases are cooled against the heating surface of the boiler before combustion is complete, rendering it almost impossible to operate without producing smoke.

At their works at Barrow-in-Furness, the Vickers Company have erected a large whirling apparatus for making tests of propellers for airships and aeroplanes. It consists of a whirling arm 166 feet in length, which is mounted on ball-bearings in a cast-iron center column. By means of gears and shafting, the propeller, which is mounted at the end of the longer arm, 110 feet from the mast, is driven by a 100 horse-power electric motor. The apparatus is so arranged that the propeller can drive the arm at a speed up to 70 miles an hour, the propeller revolving at from 500 to 1,000 revolutions per minute. The testing plant has been thrown open for the free use of aviators and experimenters.

A publication by Messrs. W. E. Turner and S. W. Dudley on "Developments in Air Brakes for Railroads" illustrates, by a remarkable diagram, the enormous amount of energy that can be absorbed by the up-to-date air brake. It took an engine nearly six minutes of time and three and a half miles of distance to accelerate a train to a speed of 60 miles an hour. Upon the brakes being applied, the 63,000 foot-tons of energy in the train was overcome by the brake in 18.7 seconds, and the train was brought to a dead stop in less than one thousand yards. Had the train been allowed to run free until it stopped, it would have covered about five miles before it would have been brought to rest by air resistance and journal friction.

The Navy Department has recently purchased a device which is designed to permit the escape of officers and men from submarines which may have sunk to the bottom. The invention, which has already been adopted by the British Navy, consists essentially of an airtight section or airlock built against the inside of the submarine, into which the crew of the sunken vessel will enter. Here they will find diving helmets and jackets, which, in thirty seconds' time, can be adjusted. The helmet is supplied with means for purifying the air exhaled by the breather, and the pressure outside the submarine and within the airlock being equalized, the crew leave the hull and are carried by the buoyancy of the jacket and helmet to the surface.

A firm of engineers in Milan, Italy, has applied a steam turbine to an old locomotive, and in a paper read before the Milan Association of Engineers and Architects, it was stated that the results are encouraging. The turbine can reverse, the blades being formed with the extreme outer portion curving in one direction, and an inner portion, immediately adjacent, curving in the opposite direction, with suitable valves for directing the flow of steam ahead or astern. The maximum steam consumption has been 35 points per horse-power hour and the locomotive has started well under load both on curves and on tangents. The principal advantages are the possibility of higher speed; lower consumption of oil and fuel; and lower cost of maintenance.

The most difficult problems in road construction in the rural districts are found where the soil is chiefly of sand or clay; and of these two conditions, the sand formation is undoubtedly the most difficult. In a clay formation a fairly good surface can be maintained throughout the winter and rainy season by giving a good crown to the road, and providing deep ditches on each side of it. The only possible way to improve a sandy road is to introduce some binding material which, of course, in the more remote districts, would involve heavy costs of haulage. We have seen in the western States straw and brush used to good advantage; but the life of a road built in this manner is very limited.

AERONAUTICS.

An aviator named Ehrmann, while making a cross-country flight in Spain, was struck by lightning. The machine fell blazing to the ground. The inventor escaped uninjured.

The Deutsche Fliegerbund, which was recently founded in Frankfort-on-Main, intends to offer prizes aggregating 15,000 marks for cross-country flights from Frankfort to Mannheim.

At the Rheims meet Mamet carried two passengers 92¾ kilometers (57½ miles) on a Blériot monoplane in one hour, 36 minutes, and 4 seconds, or at a speed rate of practically 36 miles an hour.

Mr. J. Armstrong Drexel made a remarkable flight on June 19th in a Blériot monoplane from Bournemouth to Beaulieu, England, a distance of 35 miles, partly over the sea. He carried a reporter with him, who made notes of the trip.

The closing days of the meet at Atlantic City included the making of a world's height record by Brookins with his Wright biplane and of an American speed record for a distance of 50 miles over an accurately measured course by Curtiss.

At Mineola, L. I., recently Joseph Stevenson was nearly killed in a biplane built by Brauner of the Curtiss type. Although there was some evidence that the machine was wrecked because of instability, the chances are that the accident was largely due to the aviator's lack of skill.

Ill luck still pursues Count von Zeppelin. On July 19th the gas works which supply the Zeppelin Airship Company's aerial cruisers at Friedrichshafen were blown up, and six workmen were injured. The works had been erected from the fund popularly subscribed after the destruction of the "Zeppelin IV." at Echterdingen.

The New York Times-Chicago Evening Post $25,000 aeroplane prize has been further augmented by the offer of $1,000 from the Aero Club of Pennsylvania. The offer is made to the winner of the Chicago-New York aeroplane race for one week's display of the machine in which he wins the prize regardless of the condition of the machine at the finish.

Clifford B. Harmon, president of the National Council of the Aero Club of America, has offered a prize of $1,000 in cash or plate to the contestant in the New York Times-Chicago Evening Post $25,000 aeroplane race from Chicago to New York, who first flies 500 miles in fifty consecutive hours in that contest. In the present state of aeroplane development, it is not likely, in our opinion, that the prize will be won.

It was inevitable that aerial navigation should be made the subject of foolish financial and mechanical schemes. From Missouri, for example, comes the news that a corporation has been formed to build a commercial passenger airship with a carrying capacity of 100 and a speed in a 40-mile wind of 100 miles an hour. Plans of the machine are not before us, but we are assured by a contemporary that the machine is a combination of a gyroscope, helicopter, and aeroplane.

Curtiss's speed record was made on July 11th and consisted of 10 laps of a 2½-mile course. The flight was made at a height of several hundred feet, at which elevation a fairly strong breeze was blowing. This retarded the aeroplane somewhat in one direction. The time for the 50 miles, excluding the time consumed in making the turns, was 1 hour, 14 minutes and 59 seconds, corresponding to a speed of 40 miles per hour.

Walter Wellman and Melvin Vaniman have announced their intention to attempt a flight across the Atlantic from New York to London in the near future in Wellman's dirigible "America" with which he attempted to fly to the North Pole. The airship has been enlarged and remodeled and both aeronauts express their confidence in the success of the undertaking. Should this voyage be accomplished our country would be put in the lead in the field of aerostation as well as in aviation.

Some details of Capt. Rolls's death are reported in the newspapers. It seems that Rolls was taking part in a competition for a prize of $1,250 for the nearest landing to a set mark. Rising to a height of about 100 feet, he turned and started to descend against the wind in one of those downward swoops which have made the flights of Paulhan, Brookins and Hamilton so sensational. In such a maneuver the front horizontal rudders or elevators are called upon to sustain a pressure which may well be greater than that for which they were designed. In Rolls's case it is said that the strain proved too much, and that the horizontal rudder snapped from its supports. This theory of his death is plausible, although it seems to us that the Wright machine in America, at least, is so staunchly constructed that such an accident is remote. In fact, Brookins, who flies a Wright machine, has made many such downward swoops without apparently straining the machine at all.

SCIENCE.

Color photography is now applied to surgery. An autochrome plate is taken of the diseased condition before operation, so that the student may study the condition and have a better means of identifying a disease than the present black and white photograph affords.

Excavations under the Via Labicana at Rome have brought to light a marble statue of Cæsar Augustus of natural size. It is said that the head and neck are not of a piece with the body, the marble of which is slightly coarser and darker. Evidently the later Roman practice of surmounting the head of a reigning emperor upon an old bust was practiced even in the days of Augustus.

In the Zentralblatt der Bakteriologic, R. Kusserow presents the following new theory of alcoholic fermentation. First, the yeast, having the property of absorbing oxygen, reduces a portion of the sugar contained in the nutrient liquid, to a bivalent alcohol. Second, this bivalent alcohol is decomposed into the simpler ethylic alcohol, carbonic acid, and hydrogen. Third, the hydrogen in statu nascendi reduces a further amount of sugar, the bivalent alcohol thus formed is decomposed again, and so forth, until the fermentation process is brought to an end either by the using up of the sugar or by the oxidation of hydrogen. The first impulse to start fermentation is given by the living yeast cell, but its place may be taken by juice extracted from yeast by pressure, while juice has reducing properties, or by some other organism capable of producing similar effects. The continuation of the fermenting action is due to a purely chemical cause, the presence of the oxygen formed anew constantly.

Catalytic reactions are those which are caused by the presence of certain bodies, which are called catalyzers, and of which platinum black is the type. Experiments have recently been made for the purpose of determining whether these catalyzers can produce their effects at a distance. When a mixture of hydrogen and oxygen in the proportions in which they exist in water was placed near platinum black, from which it was separated by a film of blown glass, thin enough to show the iridescent colors of a soap bubble, no combination was produced. When the glass was replaced by a film of collodion or of gelatine, combination took place slowly at a rate proportional to the pressure of the gas. In this case the combination is caused by passage of the gases through the film. Platinum black placed opposite a gelatino-bromide photographic plate, at a distance of one-twenty-fifth inch, exerts a negative action, that is to say, it removes the fog produced by previous slight exposure of the plate to light. This action occurs only on the surface of the film and only in a damp atmosphere.

The Smithsonian Institution has just published, under the title "Mechanics of the Earth's Atmosphere: a Collection of Translations by Cleveland Abbe—Third Collection," a bulky volume including translations and reprints of all the most important memoirs relating to the subject in question that have appeared since the publication of a similar collection by Prof. Abbe in 1891, as well as a few noteworthy memoirs of earlier date. This is one of the most valuable in the long list of works produced by the dean of American meteorologists in his marvelously active scientific career, extending over more than half a century. The twenty-five memoirs here presented begin with Hadley's classic paper on the trade winds, communicated to the Royal Society in 1735: include some hitherto neglected memoirs by Braschmann and Erman, dating from the middle of the last century; and cover all the latest advances in dynamic meteorology as embodied in memoirs by Pockels, Gorodensky, Gold, Guldberg, Mohn, von Bezold, Neuhoff, Margules, and others. The brief introduction is an illuminating sketch of the history of this field of investigation.

If an iron rod is supported at a point near a node of vibration and is struck, a musical sound is produced. M. Robin has recently observed that when the temperature of the rod is greater than that of the surrounding air the pitch of the sound is diminished in a regular manner, and that the intensity of the sound diminishes rapidly with increase of temperature. With iron and steel containing little carbon, the musical sound entirely disappears a little below the boiling point of water, and only a confused noise is heard. If the temperature is still further increased the musical sound again becomes audible at about 300 deg. F. Its intensity increases to a maximum and then diminishes, and the sound again vanishes at a red heat. At this temperature all metals appear to behave in the same manner, but the extinction of the sound at about 212 deg. F. appears to be peculiar to iron and possibly nickel. The temperatures of silence of steel vary with the proportion of carbon. Silence is complete between 203 and 297 deg. F. in steel containing 0.2 per cent of carbon and between 185 and 248 deg. F. in steel containing 0.45 per cent of carbon.

A New Improvement in the Belin Process of Picture Telegraphy

BY DR. ALFRED GRADENWITZ

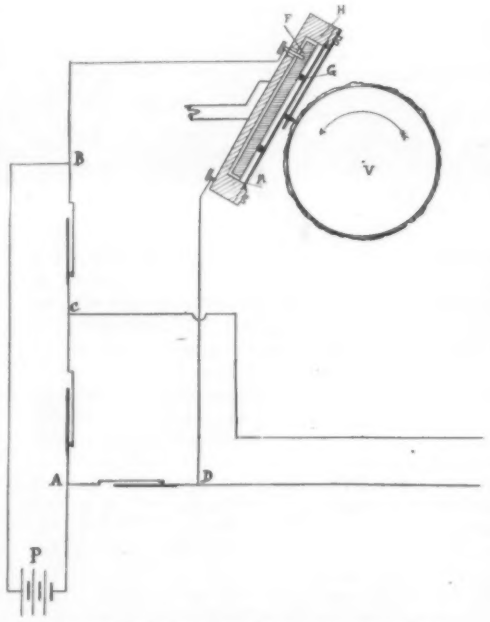
Few problems of recent years have assumed the same degree of popularity as the telegraphic transmission of pictures and handwriting. Among the inventors concerned with the solution of this problem there are many who only consider it as a preparatory stage in the fulfillment of a task far more difficult, though incomparably more interesting, viz., the problem of electrical television, that is, a process enabling any kind of objects or animated scenes to be made visible at the other end of a telegraph or telephone line, which in spite of its undoubted attractiveness, possesses very limited practical possibilities. Tele-photography proper, however, is likely to prove of extraordinary value, especially for the purposes of the illustrated press. As soon as a faithful picture of an event, in addition to the news itself, is transmitted to any distance without any loss of time worth speaking of, photographs will assume the same degree of actuality as the reports of newspaper men. The tele-photographic process invented by Professor Korn seems to be quite suitable for such purposes. In fact, his apparatus has already been used occasionally for the telegraphic transmission of pictures.

It will be remembered that a French inventor, Mr. Edouard Belin of Paris, some time ago designed a new tele-photographic process repeatedly discussed in these columns.* This has recently been brought to such a degree of perfection by the surprising sharpness and effectiveness of its reproduction as to excel anything so far done in the same line.

Already, in the first experimental apparatus, as well as in the second outfit constructed for use in transmission between Paris and Lyons, the vital organ of the Korn apparatus and the scheme of most other inventors, viz., the selenium cell, had been replaced by a variable rheostat arrangement.

A photographic print in bichromated gelatine, presenting a series of marked elevations and depressions (corresponding to the shades of the picture), was wound round a cylinder rotating in front of a tracing point carried by the short arm of a lever. The long arm of the lever carried a little wheel rolling upon a series of silver plates alternating with minute sheets of mica of an aggregate thickness of only 1/10 of an inch. By sliding on the elevations and depressions of the picture the double arm lever, with the wheel affixed to its end, thus inserted into the circuit a variable resistance depending upon the depth, and accordingly the shades of the various portions of the picture. The fluctuations in current intensity thus introduced into the circuit were transmitted over the telegraph or telephone line, in order to be reconverted at the receiving station into fluctuations of luminous intensity.

In spite of its relative accuracy and the richness of details obtained with a rheostat of sufficient gradation, there still remained a certain hardness of shades in the reproductions obtained at the receiving station, because of the step-wise alteration in resistance on which the process was based. The inventor, therefore, replaces in his new apparatus, the gradated rheostat by a microphone of special construction, which not only excludes any abrupt variation and corresponding harshness of shades, but, on account of its sensitiveness, is actuated even by the minute differences in relief present in any ordinary photographic print, so that there is no necessity of preparing any special photograph.



Scnematical view, showing arrangement of microphone.

A sketch transmitted by picture telegraphy.

The apparatus installed at the sending station outwardly resembles a phonograph. The picture to be transmitted is wound upon a rotating cylinder which, like a phonograph roller, at the same time performs a progressive motion in the direction of its axis. The microphone above referred to is substituted for the phonograph membrane, converts those slight elevations and depressions in the photographic print (corresponding to the shades of the picture) into fluctuations of current intensity, which, like telephone currents, are transmitted over a line of electrical conductors, to the receiving station situated at any distance, in order there to be reconverted by a sensitive galvanometer (oscillograph) into fluctuations of luminous intensity. In fact, this galvanometer carries a mirror which, according to the intensity of the current flowing through it, undergoes a variable deflection, thus controlling, in conjunction with a scale of graded shades, the intensity of light acting upon the photographic film or paper. This is how, with an extraordinary sharpness, are reproduced in succession, all the various points of the picture, even the slightest shades being fully rendered without any abrupt transition.

The most interesting part of the apparatus, viz., the microphone, which also lends itself for use in long-distance telephone communication, is constructed as follows:

To a flat cylindrical box is fixed an insulated carbon bottom *F*, and to this is attached another insulating plate *G* perforated with holes 2 millimeters (0.0787 inch) in diameter, that are arranged at equal distances apart, on three concentric circles. Into each of the holes is tightly fitted a carefully shaped spherical carbon grain, and against these grains is applied a carbon membrane *M*, 90 millimeters (3.54 inches) in diameter, and 7 hundredths of a millimeter (0.00276 inch) in thickness. This membrane is substantially enchased at the edges and communicates directly with the microphone box, to which one of the terminals of the circuit is connected, while the other terminal communicates with the bottom plate *F*.

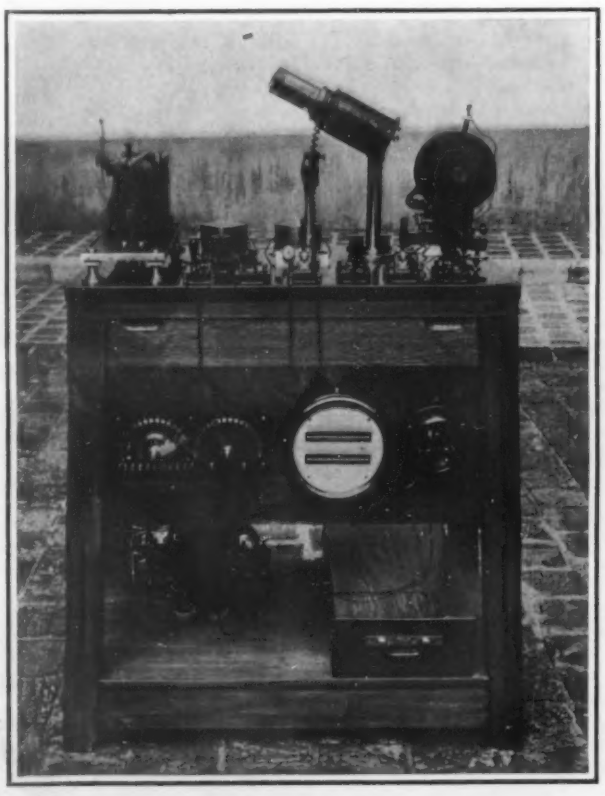
The exact position of the membrane *M* is adjusted by properly tightening some paper rings on which it is resting. The system constituted by the bottom plate, the grains and the membrane, thus is conductive, and if the resistance of the contacts were *nil*, would short-circuit the two terminals. However, each grain obviously forms a shunting of the circuit, the internal resistance of the microphone being lower as the number of grains is more considerable. In actual practice Belin has found three grains to be quite sufficient, provided these grains be located at the three summits of an equilateral triangle, but the sensitiveness of the system could obviously be increased or diminished at will by altering the number of grains and distributing them either over the three circles, or any one of them.

For the sake of its application to tele-photography, the microphone is so adjusted that the membrane will tighten the grains sufficiently to prevent any motion between them

(*Continued on page 92.*)

* See Scientific American, December 21st, 1907, and June 12th, 1909.

A portrait sent by means of tele-photography.



General view of the tele-photographic station.

A view sent by the Belin tele-photographic system.

A NEW IMPROVEMENT IN THE BELIN PROCESS OF PICTURE TELEGRAPHY.

The Military Automobile as a Weapon against Airships and Flying Machines

EXPERIMENTS MADE BY A MILITARY ACADEMY

With the rapid strides and progress made in aerial navigation, it is eminently necessary that the army seriously consider methods for counteracting the influence such craft will have in future wars. The inventions of the Krupps and other military experts in the manufacture of guns firing from fixed mounts explosive shells, etc., all have their value; but any hunter knows the difficulty of hitting a flying bird with a rifle, even when fired from the shoulder.

Furthermore, the number of shots which can be fired at a balloon or other aerial craft is necessarily limited. It seems necessary, therefore, that some means be furnished whereby the craft may be followed at least to a certain extent, and its movements not only watched but if possible defeated by fire from below.

Major Davidson of the Northwestern Military Academy has been making experiments with rapid fire guns mounted on automobiles since the early day of the horseless vehicle, 1898, with the cadets from the institution. Some very interesting as well as valuable tests of the automobile as a balloon destroyer have been carried out.

With a 1909 Cadillac "30" purchased in the summer of 1909, preliminary experiments were made. Two more Cadillac "30's" were purchased by the academy in the spring of 1910 in order that the experimental work might be more thoroughly carried on. These automobiles of stock chassis are made to seat four cadets, and mount a Colt automatic rapid fire gun over the engine. The guns of .30 caliber deliver automatically 480 shots a minute, having a sighted range of 2,000 yards. The tents and blankets are strapped on the rear; the personal clothing, cooking utensils, etc., to the running board, and compartments made for carrying 5,000 rounds of ammunition are arranged under the rear seat.

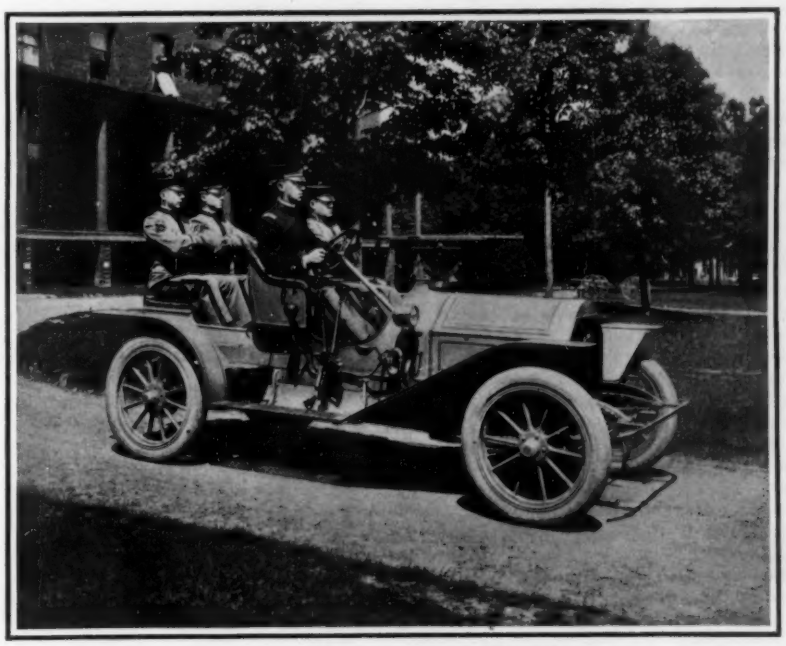
With this extra equipment, totaling between 400 and 500 pounds in weight, this automobile corps of two machines with a crew of four cadets in each completed the strenuous run of the Glidden tour from Cincinnati to Chicago via Dallas, Texas. Field conditions were maintained and country traversed which would be a tax on even horse-drawn artillery. The carriages were driven and operated by amateurs, and at the completion of the 2,850 miles, the machines were found by careful examination to be in perfect running condition, and aside from the scars, due to a run through partially roadless country, were ready for immediate field service.

The results of the experiment clearly demonstrate that not only would the automobile be a ready but effective means for keeping in touch with moving aerial craft, where roads are in normal condition, but that the rapidity of fire would be such that military automobiles must be reckoned with as weapons against airships and aeroplanes.

It is, furthermore, a question whether such a balloon-destroying battery would not be an effective addition to the fighting force in almost any portion of our country a large part of the year, and in some parts throughout the twelve months. The rapidity with which it can cover ordinary country is far greater than could possibly be secured through horse-drawn carriages, and its work could be confined to country best suited for its operation. In fact, with the use of windlass attachments which Major Davidson has by a very simple projection to the wheel hubs arranged on the machines, the carriages will pull themselves out of the deepest mud holes, and while there may be a loss of a few moments in a place of this kind, the time is more than made up by the speed maintained when hard ground is found.

Exhaustive experiments have demonstrated that when roads are in such condition that the automobile cannot at least maintain three to four miles an hour, they are practically impassable for any other kind of vehicle; that with the exception of possibly a few weeks in the spring, the automobile will negotiate all ordinary mud and snow, while if the roads be in the condition in which they can usually be found throughout the country nine months of the year, a speed of from twenty to forty-five miles an hour can be readily maintained. The argument frequently put forward regarding the puncturing of tires, could, in war time, be easily offset either by the use of semi-pneumatic or in fact solid tires at the sacrifice of only a few miles per hour of speed, and at a slightly greater jar to the carriage.

The experiments are to be continued through the summer at the different army maneuvers, and much valuable information will be in the hands of the War Department at the close of the season's work as to the value of the automobile as an adjunct to the military service in a country noted for its poor roads.



Aerial machine gun carried on automobile.

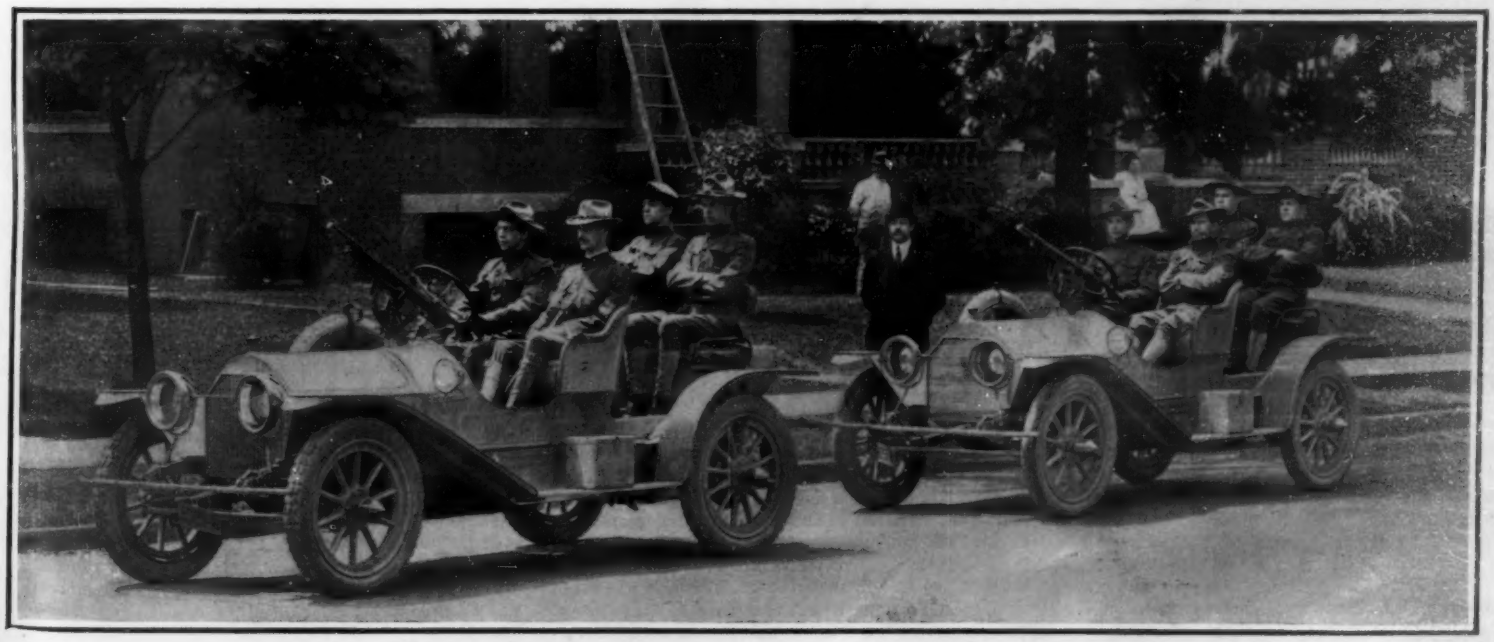
A Forecast of 1911 Automobiles.

It cannot be expected that the 1911 automobiles will show any radical innovations, but the changes and improvements that have been adopted indicate a similarity in conception and design that tends to eliminate distinctions between the different makes. The automobile is not yet standardized, but the differences between a model and its successor are now so slight that an increasing number of manufacturers are abandoning the custom of identifying their cars by years in favor of a letter or a number that indicates a type rather than the date of production. This is an advantage from the sales point of view, and it permits a used car to be disposed of at a truer equivalent to its value than is possible under the dating system.

A large number of cars of low price and horse power are scheduled for production during the 1910 season, but for 1911 the proportion will be far greater. This is not so much because the makers are adopting the European custom of adding a small car to their lines, as it is to newcomers to the industry, and to increases in the output of existing concerns. The production will undoubtedly be very great, and indicates an optimistic view of the ability of the market to absorb it. The design of these cars is very creditable, and in them the industry is meeting the call for serviceable vehicles at moderate prices. Practically all of these cars have four-cylinder engines, sliding gear sets and shaft drives, and are similar in other details to cars of higher price and power. Competition between their makers will evidently be so keen that the selling prices will include only a fair profit.

The appearance of the 1911 cars will be somewhat different from that of their predecessors, and shows the influence of the so-called "torpedo" type that was introduced two years ago. The smooth lines and curves of this design originated in an effort to reduce the tendency to raise dust, but this is a detail that

(*Continued on page 93.*)



A military academy's automobile airship repelling outfit.

THE MILITARY AUTOMOBILE AS A WEAPON AGAINST AIRSHIPS AND FLYING MACHINES.

A PROFILE OF THE ATMOSPHERE.

Mainly within the past decade meteorology has become a science of three dimensions. While this science in the past concerned itself chiefly while the horizontal stratum of the atmosphere immediately overlying the earth's surface, to-day the equal importance of researches in a vertical direction is recognized in the existence of a large number of observatories specially equipped for sounding the air up to great altitudes, and the fruit of their investigations constitutes the new science of aerology.

Charts of the atmosphere in horizontal section are familiar even to the non-scientific public, in the form of the daily weather maps published by the meteorological bureaus of all civilized countries, and to all students of meteorology and physical geography in the form of climatic charts, showing the horizontal isotherms, isobars, and the like. The work of mapping the atmosphere in the vertical has been only just begun, but with the abundant aerological data now accumulating it is likely that in a few years vertical section maps of the atmosphere will become common in scientific literature, illustrating both the average and the instantaneous distribution of the meteorological elements.

The accompanying diagram, reproduced from a paper by Dr. Alfred Wegener in a recent number of Das Wetter, illustrates the field of aerological investigation; i. e., the whole extent of the atmosphere in a vertical direction.

The partly shaded strip at the base of the diagram represents the portion of the atmosphere called the troposphere, or region of convection, extending from the earth's surface up to the level of the cirrus clouds. In middle latitudes its upper limit is at about 10 kilometers (6.21 miles). Within this relative shallow stratum lies three-fourths of the total mass of the atmosphere, and herein are confined the great convectional disturbances known as cyclones and anticyclones. This region has been explored up to an altitude of 7 kilometers (4.35 miles) with meteorological apparatus attached to kites, and it was penetrated quite to its upper limit by the balloonists Berson and Süring in their ascent of July 31st, 1901, when they attained an altitude of 10,800 meters (35,324 feet).

Above the troposphere lies the stratosphere, or isothermal layer, extending upward to an unknown height. This region is inaccessible to kites and manned balloons, but has been penetrated to an altitude of 29 kilometers (18.02 miles) by sounding balloons, carrying meteorographs. Here the air is exceedingly dry and cold, and is in a state of vertical isothermy; i. e., there is no decrease of temperature with increasing altitude such as we observe in the lower atmosphere. There is probably little interchange of air by convection, and there are no violent disturbances such as constitute the storms of lower levels.

Above the heights reached by sounding balloons we have no direct instrumental record of the conditions of the atmosphere, and must resort to other means of investigation. From the duration of twilight we infer that at an altitude of about 70 kilometers (43.5 miles) the air becomes so tenuous that it can no longer reflect light to the earth. A little higher, viz., at about 80 kilometers (49.7 miles), our topography of the atmosphere must take account of the "noctilucent clouds" observed for some years following the eruption of Krakatoa, and likely to be seen again after any great volcanic eruption. They consisted of dust projected to this great height—far above the highest level of true clouds—by the volcano, and shining with reflected sunlight.

Still higher the presence of an atmosphere is indicated by the trails of meteors, which appear to be especially numerous between 100 and 150 kilometers (62.14 and 93.21 miles) above the earth.

The highest of all atmospheric phenomena of which we have any knowledge are auroral discharges, which, however, also occur at lower levels, down to the earth's surface. These appear to have two levels of maximum frequency, viz., at about 200 kilometers (124.3 miles), and at 60 to 70 kilometers (37.3 to 43.5 miles) above the earth's surface.—Excerpted from Das Wetter.

Summary of the Rheims Aviation Meet.

BY W. F. BRADLEY.

It is only necessary to place side by side the various records made at the 1909 and the 1910 aeronautical meetings at Rheims to realize the progress that has been made in the brief period of eleven months, and at the same time to be convinced of the success of the gathering on the Champagne plain.

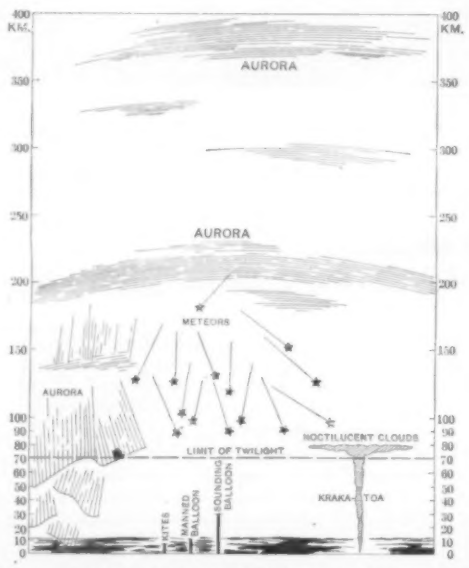
At the 1909 meeting the longest distance flown without coming in contact with the ground, was 111 miles accomplished by Henry Farman on a biplane of his own construction. This record has been left far in the rear, for René Labouchère, piloting an Antoinette monoplane with an Antoinette motor, covered a distance of 212 miles in a single flight. Cattaneo, the fourth man on this year's list, is equal to Farman last year. From the standpoint of distance and endurance there is an even better performance than that furnished by Rene Labouchere, for Olieslagers, the daring pilot of a Blériot monoplane, remained aloft for 5 hours, 3 minutes 5 seconds, partly after official hours, during which time he flew 244.2 miles. This made him the owner for the time being of the Michelin Cup, won last November by Henry Farman after a flight of 145 miles.

A year ago aeronautical experts were amazed at the audacity of Latham when he rose to the record height of 508 feet. This year the height record has been established by the same pilot at 4,540 feet. No fewer than eight men more than doubled the record of a year ago, George Chavez, on a Blériot, rising to an altitude of 3,772 feet; Morane, also on a Blériot, to 2,460 feet, and five others to altitudes of not less than 900 feet.

In the matter of passenger carrying, immense progress has been made, for in 1909 Henry Farman was only able to cover a distance of 6 1/5 miles with two passengers on board his biplane. This year Mamet, a Blériot pilot, flew 58 miles with two passengers on board (making three persons in all), and Aubrun, with the same make of machine, travelled a distance of 85 miles with one passenger on board.

The speed record at Rheims this year was made by Morane with his 100 horse-power Blériot. He covered 5 kilometers (3.1 miles) in 2 minutes 48 seconds, or at the rate of 66.53 miles an hour.

Last year's speed records never existed in comparison with what was possible at the recent meeting. The fastest time in public competition a year ago was made by Glenn H. Curtiss, on a biplane of his construction, when he flew 12.42 miles in 15 minutes 50 3/5 seconds. This year Morane, on a racing Blériot, flew the same distance in 12 minutes 45 3/5 seconds. Brought down to miles per hour, the Curtiss flight was at the rate of 47.04, while the Morane record of the present year is at the rate of 58.4 miles an hour. Every other speed record established last year has been wiped out of existence. For 10 kilometers (6 1/5 miles)



THE EXTENT OF THE ATMOSPHERE IN A VERTICAL DIRECTION. HEIGHTS IN KILOMETERS.

Blériot's best time last year was 7 minutes 47 4/5 seconds; this year a Blériot machine covered the same distance in 5 minutes 42 2/5 seconds. For a distance of 30 kilometers (18 3/5 miles) the Curtiss figure of 23 minutes and 29 seconds has been lowered by Olieslagers to 22 minutes 31 seconds. The 50 kilometer record made a year ago by Latham, has fallen from 43 minutes 56 seconds to 37 minutes 50 3/5 seconds, accomplished by Alfred Leblanc on a Blériot. One year ago the record for 100 kilometers was 1 hour 28 minutes 17 seconds, made by Latham; this has been lowered by Alfred Leblanc to 1 hour 16 minutes 11 seconds for the 62 1/10 miles. No speed records existed at the close of last year's meeting for distances above 111 miles; this year they have been established for distances up to 212 miles.

One year ago Curtiss was able to capture the James Gordon Bennett cup for America with a machine capable of an average speed of 47 miles an hour. In order to retain it he will have to increase his speed by not less than 45 per cent, for if France lines up in this race Alfred Leblanc will have an aeroplane similar to that flown by Morane, and capable, on a round course, of traveling at the rate of 75 miles an hour. In the French elimination for the Gordon Bennett cup the fastest time was at the rate of 47½ miles an hour, but this was for a distance of 62 miles, and was made by a Blériot having a motor of only 50 horse-power. The fastest racing Blériot has 100 horse-power furnished by a 14-cylinder air-cooled Gnome motor. The other two competitors for the Gordon Bennett trophy are Hubert Latham and his cousin René Labouchere, both of them Antoinette pilots, who over a distance of 62 miles maintained practically the same average as Curtiss last year for a distance of 12 miles.

One record only remained unbroken at the recent Rheims meeting. It is that for dirigible balloons. A year ago the airships made a miserable showing by the side of the aeroplanes; this year, although attractive prizes were offered, not a single lighter-than-air machine came forward to compete for them.

A remarkable feature about the Rheims aeroplane races is that in every competition the first place has fallen to a monoplane. The single plane machines were decidedly the fastest; they could fly the highest, and they were able to come forth in wind and rain that kept the biplanists in their sheds with locked doors. The Grand Prix de Champagne offered to the constructor whose three machines flew the greatest total distance, fell to the Antoinettes with 1,616 miles, second place going to the Blériot monoplanes, and the Farman and Sommer biplanes being classed third and fourth.

In the competition for the greatest distance in a single flight an Antoinette monoplane headed the list with a Blériot monoplane second, a Farman biplane third, and a Blériot monoplane fourth. For the Michelin cup a monoplane led with 244 miles. In the French elimination for the Gordon Bennett race three monoplanes, a Blériot and two Antoinettes, alone qualified. In the height competition the first three places went to monoplane machines, and out of the nine qualifying with a minimum distance of 290 feet, only three were biplanes. For speed, on either long or short distances, honors rested with the monoplanes; it was only in the cross-country race that the biplane was able to make a showing by coming in fourth.

Biplanes showed up to better advantage in the totalized distance event, comprising all flights made during the meeting, with the exception of attempts at speed records. First place went to Olieslager's Blériot monoplane, with 1,051 miles, while Farman biplanes secured both second and third positions.

It is due to two firms, Antoinette and Blériot, that the monoplane has been able to secure the premier position and totally eclipse the biplane performances. The improvement in the Antoinette is one of the motor only, the machine being practically the same as was shown last year, the changes being mere details that in no way influence its stability or endurance. The eight-cylinder motor, which had earned the reputation of being fickle, is the same in general features, but has been considerably modified in details. The cylinders have a one-piece electrically-deposited water-jacket, without any of the joints which were apt to give trouble in the old motor. Ignition, instead of being by storage batteries, is now by high-tension magneto; on two of the motors a carbureter had been fitted in place of direct injection of gasoline, and on Latham's machine a large diameter moderately light flywheel was used. The changes resulted in the motors working to perfection, not a single Antoinette flight being brought to a stop by reason of motor trouble.

The Blériot success is due to both aeroplane and motors. A year ago the only really successful Blériot was the racer which competed against Glenn H. Curtiss for the Gordon Bennett cup. In the meantime this type of machine has been abandoned, and the new Blériots are an enlargement and an improvement on the No. XI, or cross-Channel type of flyer. In place of the three-cylinder Anzani motor, however, they are all fitted with seven-cylinder revolving Gnome motors developing 50 horse-power. There is an exception in the case of Morane's machine, which has the new 14-cylinder 100 horse-power Gnome motor, with a wing area reduced to 129 square feet. This is undoubtedly the fastest aeroplane ever built. During the meeting experiments were made with the 100 horse-power Gnome on a Farman biplane with very indifferent results, the machine so equipped not taking part in any public competition.

The Current Supplement.

The opening article of the current Supplement, No. 1804, deals with the ill-fated voyage of the "Deutschland," the huge aerial passenger liner which came to grief not so long since in Germany. Excellent pictures accompany the article, showing how wonderful were the accommodations on board this first craft of its kind. Mr. Frank McLees contributes a fine article on the egg-shaped oval. Combined turbines and piston engines for marine use are discussed. Sir J. J. Thomson's course of lectures at the Royal Institution on electric waves and the magnetic theory of light, is summarized. Mr. Octave Chanute's excellent paper on recent progress in aviation, in which he reviews the present state of the art, is continued. Mr. Walter Rosenhain contributes a good article on light alloys. The inheritance of artificial color modifications is simply explained by Dr. Paul Kammerer. The English correspondent of the Scientific American writes on the tinmining industry of Cornwall. Thomas Mitchell Shackleford explains what pragmatism is.

Correspondence.

EXPERT SUGGESTIONS AND COMMENTS ON THE RULES FOR THE GOULD-SCIENTIFIC AMERICAN MULTIPLE-MOTOR AEROPLANE PRIZE.

To the Editor of the SCIENTIFIC AMERICAN:

To make Mr. Edwin Gould's generous and timely offer fulfill its purpose, "to advance the practical usefulness of the heavier-than-air machine" to the fullest extent, the rules, in the writer's opinion, should stipulate: (1) That the machine carry *two operators* and that one of them be placed within easy reach of the motors. (2) That the motors can both be *cranked* from this man's seat. (3) That the propellers can be thrown into by clutches. (4) That each propeller can be driven by its own motor, or both propellers, in tandem, driven by either motor.

As requirements 3 and 4 have been fulfilled to perfection in the Parseval airship without adding appreciable weight, they should not be called extravagant in a flying machine.

(5) That the motors should be designed to allow removing and replacing spark plugs and valves from the seat of one of the operators almost as quickly as the breech block can be removed from a rifle and replaced again gas tight. (6) The magneto, circulating pump, oil pump, valve gear, and ignition apparatus should be capable of instantaneous access and adjustment from the seat of one of the operators. (7) There should be two circulating pumps, each of which can be driven by either motor. Each must have sufficient capacity to supply the two motors together, with a suitable switching arrangement. (8) The magneto should automatically couple to either motor in operation, and give ample current for both. (9) There should be a battery in reserve, that is, automatically switched to both motors, whenever the magneto should fail to furnish current enough. The battery should be strong enough to furnish current for both motors. (10) There should be a *spark coil in reserve* that can be switched on by pressing a button. (11) There should be an *auxiliary hand oil pump* connecting with both motors. (12) The contest should include a competition in repairing a motor in the air. One of the motors should be disabled by the judges and the machine should be put to flight with the other. The prize should be awarded to that machine which first succeeds in stopping the motor with which it started, and continuing the flight with the disabled motor, repaired in the air. This test should be repeated with different parts of one of the motors intentionally disarranged by the judges. It will of course be prohibited to touch this motor before the machine has left the ground. The operators must be kept in ignorance of the nature of the disarrangement. The cause of the trouble must be discovered in the air.

(13) The propellers must be so placed that either of them alone can keep the machine afloat. (14) Other things being equal, the prize should go to that machine which proves itself capable of maintaining flight with one motor alone without straining it to the limit, at least, while this one motor drives both propellers. A device for changing the pitch of the propellers, like that used on the Parseval airship, will make it possible to diminish the slip, whenever one motor drives both propellers, and still allow that one motor to run at its most economical speed. A change speed gear would answer the same purpose with the ordinary type of propellers.

(15) There should be a contest of economy and endurance with both motors driving simultaneously at reduced power. The result of this test should also count in awarding the prize. CARL DIENSTBACH.

New York, 1910.

To the Editor of the SCIENTIFIC AMERICAN:

I have the honor to acknowledge receipt of your letter inclosing preliminary draft of rules for the Gould prize, with request for suggestions and criticisms.

The following are a few of the ideas which occur to me in connection with a twin-engine aeroplane:

(*a*) An aeroplane equipped with two separate and entirely independent power plants should have each engine, and its corresponding transmission and propelling apparatus, so designed that in case one engine fails the other plant can be instantly made operative.

(*b*) Each power plant when operating alone should in no way be dependent or in any way connected with the other, thus avoiding any common working parts which might put both plants out of commission in case one fails.

(*c*) Each power plant, therefore, should be capable of starting without assistance from the other, and each should be designed so that either plant can be started while the machine is in flight. The problem of starting an engine after it has once been cut off, with the aeroplane still in flight, has not as yet been solved, and it will probably be a hard one to solve. However, if aeroplanes come to the use of reserve engines this problem must be worked out, and it must be worked out without the assistance of the other engine.

(*e*) If any universal gear is used to operate both plants at the same time, this gear should be thrown out, and at rest, when a plant operates independently.

(*f*) Under the heading "Contest Committee," it is suggested that at least one member of the committee be an experienced aviator. Under the same heading it is noted that "they shall also act as judges in determining which machine has made the best flights." If the prize is to be awarded both for the most practical aeroplane and a practical twin power plant, then the best flights should be taken into consideration. If the practical twin power plant is the prime object of the prize—and I think it should be—then the question of the machine making the best flights should not be considered. If the machines operate with their twin power plants, the question of which machine makes the best flights will depend mainly on the skill of the operators.

If more than one machine develops a practical twin power plant, which fulfills the conditions required, then the action of the engines, the length of time they have been in operation, and their conditions upon landing, should be considered ahead of the question of stability, ease of control, etc. The most important factor in the development of aeronautics to-day is a reliable power plant, and until this is forthcoming, flying will not be taken up extensively.

The question of stability, ease of control, etc., of the aeroplane has been pretty well worked out, and what is needed most is a reliable engine. The problem of overcoming the effects of winds will be greatly due to more powerful engines, which will give the operator reserve power sufficient to drive his machine at greater speeds.

(*g*) As regards the possibility of people designing and building a practical machine equipped with a twin power plant, but through lack of experience unable to fly it, I believe that they should be allowed to compete, but that they should have some one operate their machines in flight, if they cannot fly themselves.

(*h*) With reference to paragraph 9, regarding the location of the place of trial, would suggest that more time be given between the date of announcing the place where trials are to be held and the date upon which they will commence. One month is too little time to pack, ship, reassemble, and try out a machine, particularly if the contestant has to ship his machine any distance.

(*i*) The problem of equipping an aeroplane with an efficient twin power plant is going to be an extremely hard one. If it is satisfactorily solved, it will be worth considerably more to aeronautics than the intrinsic value of the prize offered.

Therefore, if only one machine enters the competition, and fulfills the conditions demanded, I believe that it should be awarded the prize.

B. D. FOULOIS,
First Lieutenant Signal Corps.

Fort Sam Houston, Texas.

RULES GOVERNING THE COMPETITION FOR THE $15,000 PRIZE OFFERED BY MR. EDWIN GOULD.

1. A prize of $15,000 has been offered by Mr. Edwin Gould for the most perfect and practicable heavier-than-air flying machine, designed and demonstrated in this country, and equipped with two or more complete power plants (separate motors and propellers), so connected that any power plant may be operated independently, or that they may be used together.

CONDITIONS OF ENTRY.

2. Competitors for the prize must file with the Contest Committee complete drawings and specifications of their machines, in which the arrangement of the engines and propellers is clearly shown, with the mechanism for throwing into or out of gear one or all of the engines and propellers. Such entry should be addressed to the Contest Committee of the GOULD-SCIENTIFIC AMERICAN Prize, 361 Broadway, New York city. Each contestant, in formally entering his machine, must specify its type (monoplane, biplane, helicopter, etc.), give its principal dimensions, the number and sizes of its motors and propellers, its horsepower, fuel-carrying capacity, and the nature of its steering and controlling devices.

3. Entries must be received at the office of the SCIENTIFIC AMERICAN on or before June 1st, 1911. Contests will take place July 4th, 1911, and following days. At least two machines must be entered in the contest or the prize will not be awarded.

CONTEST COMMITTEE.

4. The committee will consist of a representative of the SCIENTIFIC AMERICAN, a representative of the Aero Club of America, and the representative of some technical institute. This committee shall pass upon the practicability and efficiency of all the machines entered in competition, and they shall also act as judges in determining which machine has made the best flights and complied with the tests upon which the winning of the prize is conditional. The decision of this committee shall be final.

CONDITIONS OF THE TEST.

5. Before making a flight each contestant or his agent must prove to the satisfaction of the Contest Committee that he is able to drive each engine and propeller independently of the other or others, and that he is able to couple up all engines and propellers and drive them in unison. No machine will be allowed to compete unless it can fulfill these requirements to the satisfaction of the Contest Committee. The prize shall not be awarded unless the competitor can demonstrate that he is able to drive his machine in a continuous flight, over a designated course; and for a period of at least one hour he must run with one of his power plants disconnected; also he must drive his engines during said flight alternately and together. Recording tachometers attached to the motors can probably be used to prove such performance.

In the judging of the performances of the various machines, the questions of stability, ease of control, and safety will also be taken into consideration by the judges. The machine best fulfilling these conditions shall be awarded the prize.

6. All heavier-than-air machines of any type whatever—aeroplanes, helicopters, ornithopters, etc.—shall be entitled to compete for the prize, but all machines carrying a balloon or gas-containing envelope for purposes of support are excluded from the competition.

7. The flights will be made under reasonable conditions of weather. The judges will, at their discretion, order the flights to begin at any time they may see fit, provided they consider the weather conditions sufficiently favorable.

8. No entry fee will be charged, but the contestant must pay for the transportation of his machine to and from the field of trial.

9. The place of holding the trial shall be determined by the Contest Committee, and the location of such place of trial shall be announced on or about June 1st, 1911.

Scientific American Prizes for Inventors.

The SCIENTIFIC AMERICAN offers $100 in prizes, to be awarded to the inventor who gives the best account of how he conceived his invention, how he developed it in actual practice, and how he succeeded in selling it. This sum of $100 to be distributed as follows: $50 to the best account, $35 to the second best account, $15 to the third best account.

There is no limitation as to the subject matter of the invention. In other words, the invention may be a household utensil, a game, a piece of electrical apparatus, an improvement in railway construction, a metallurgical process, etc. The following conditions, however, must be observed.

1. The invention must be patented.

2. The inventor must have actually sold his patent, and the invention must have been commercially introduced.

3. The account of the inventor's success must not be longer than 800 words.

4. The composition, letter, or article must be typewritten on one side of the paper only.

5. The inventor must sign his offering with a pseudonym, and inclose it in a sealed envelope, upon which the pseudonym is written. A second sealed envelope must be provided, bearing on the outside the pseudonym under which the offering is submitted, and containing the real name and address of the contestant.

6. Contestants must address their offerings to Inventors' Prize Editor, SCIENTIFIC AMERICAN, 361 Broadway, New York city.

7. The contest remains open until August 15th, 1910. Judges will select the essays which, in their opinion, have won the three prizes and give them to the Editor of the SCIENTIFIC AMERICAN, who will thereupon open sealed envelopes containing the true names of the contestants and notify the winners of the prizes.

8. The Editor of the SCIENTIFIC AMERICAN has the right to publish the prize winning articles or letters as well as those which may not receive prizes.

9. Unsuccessful letters cannot be returned. It is thereupon urged that the contestants preserve copies of their contributions.

A Jinrikisha with One Wheel.

According to Consul-General James T. Du Bois, of Singapore, a one-wheeled jinrikisha, on the monocycle principle, is being introduced among the Chinese of the Malay States. It is said to be safe and to have many advantages over the old-fashioned vehicle. There is no jarring drag in rounding corners, the wear and tear is reduced to a minimum, the work on the pullers greatly reduced, and a 20 per cent increased speed obtained. It is reported that a company is forming at Penang for the furtherance of this jinrikisha trade with China.

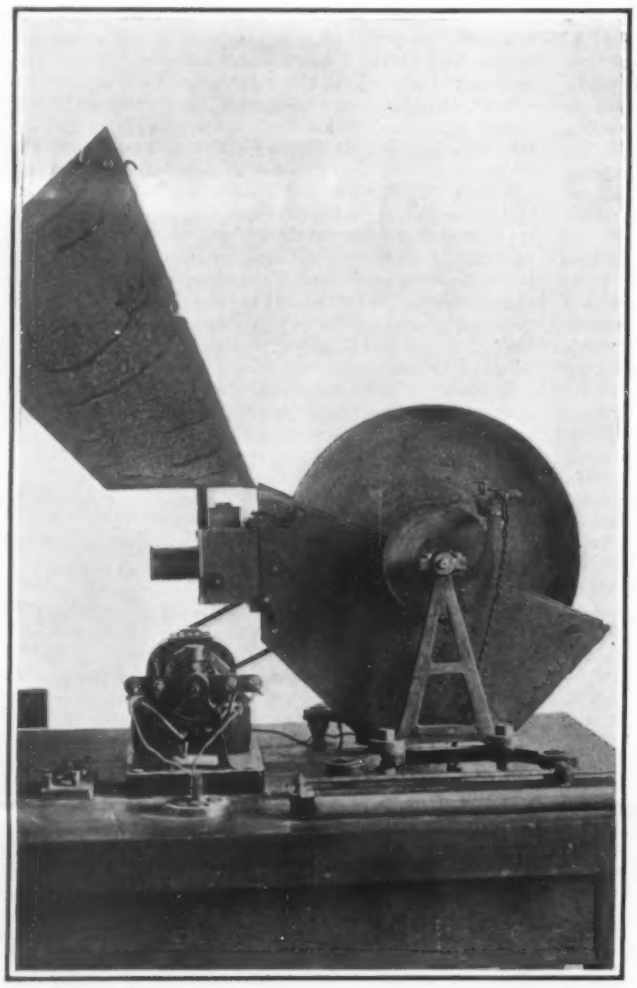
MOTION PICTURES OF THE FLIGHT OF INSECTS

BY JACQUES BOYER

The imperfection of our senses prevents our direct observation of the excessively rapid and brief movements of insects and other animals. In order to be able to analyze the fleeting impressions which these movements make upon our senses, we must have recourse to special methods, the most valuable of which is chrono-photography. This method, which was devised by the celebrated physiologist Marey, gives very exact results, which are not affected by any mechanical connection between the moving animal and the registering apparatus, but when the motion lasts less than one-hundredth of a second, as is the case with the movements of the wings of most insects, even Marey's instruments are insufficient. It is necessary to employ apparatus by which many more than one hundred photographs can be made in one second. This difficult problem of obtaining motion pictures of the flight of insects has been ingeniously and successfully solved by Bull, the assistant director of the Marey Institute.

In Marey's apparatus and the modern motion picture apparatus which is based upon it, the images are received upon a strip of sensitive film which moves intermittently through the focus of a lens which is periodically covered and uncovered by a shutter. While the shutter is open one view is photographed on the film, which remains motionless during the exposure. The shutter is then closed and the film is displaced rapidly to expose a new surface for the followest picture. Theoretically, the number of photographs made per second could be increased indefinitely by augmenting the velocity of the film, and the rapidity with which it is stopped and the shutter is opened and closed, but there is a practical limit to this increase in velocity.

In order to obtain greater speed Bull, inspired by the earlier researches of Lendenfeld, Mach and Salcher, Boys and others, substitutes a continuous for the intermittent motion. Bull's apparatus consists essentially of a cardboard cylinder 13½ inches in diameter, round which is wrapped a strip of film 42½ inches long, which is destined to receive 54 photographs of the standard dimensions used in motion pictures. This cylinder is turned by an electric motor. In order to be able to operate in daylight, the cylinder is inclosed in an octagonal wooden case, the upper part of which can be removed for the insertion and removal of the films in the dark room. The lens is placed in a little wooden camera attached to the front of the case. This camera contains an inclined mirror which reflects the image to a ground glass screen above, and thus serves as a finder. By turning a little wheel this mirror can be moved aside to allow the image to fall upon the sensitive film. The axle of the cylinder carries an electric interrupter, which can produce as many as 2,000 interruptions in a second. The interrupter consists of a disk of ebonite, in which are imbedded 54 strips of copper which are pressed by two metal brushes, as in the commutator of a dynamo. The passage of each strip of copper under the brushes closes and opens the primary circuit of an induction coil, producing in the spark gap of the secondary circuit a spark, the brightness of which is increased by a small condenser, connected in parallel with the secondary circuit. The sparks, barely 1-25 inch long, are formed between two pointed magnesium electrodes, about 1-12 inch in diameter. Behind this spark gap is a condensing system composed of two plano-convex lenses, like the condenser of a projection lantern. In some cases Bull adds a third condensing lens placed immediately behind the spark gap. All of the lenses of the apparatus are made of quartz or iceland spar, which do not, like glass, absorb the ultra-violet rays, which have great photographic power and are very abundant in the spectrum of the electric spark.

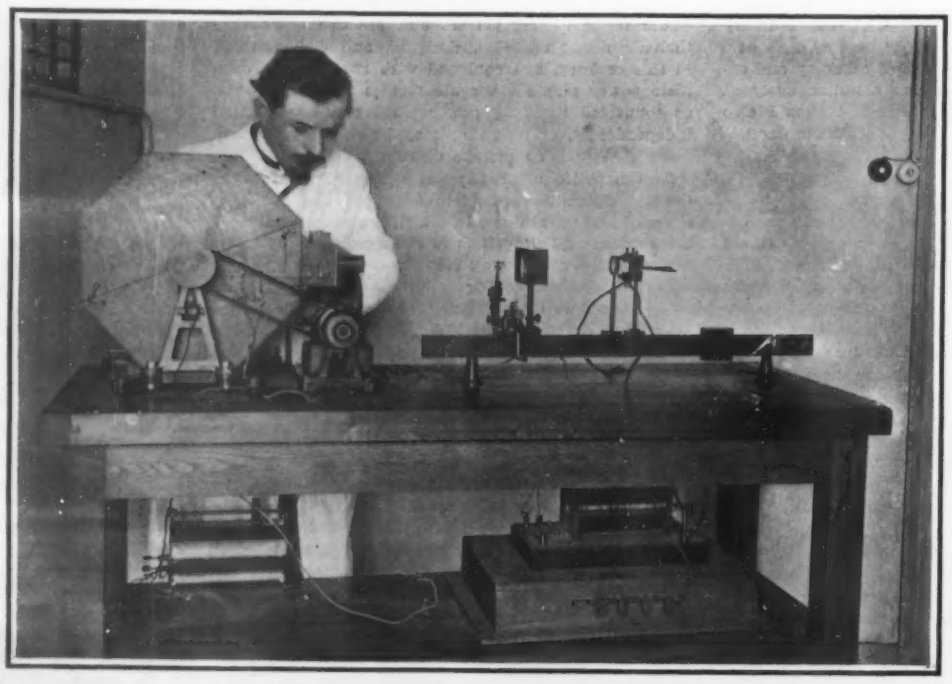


Camera and reel for making motion pictures of the flight of insects.

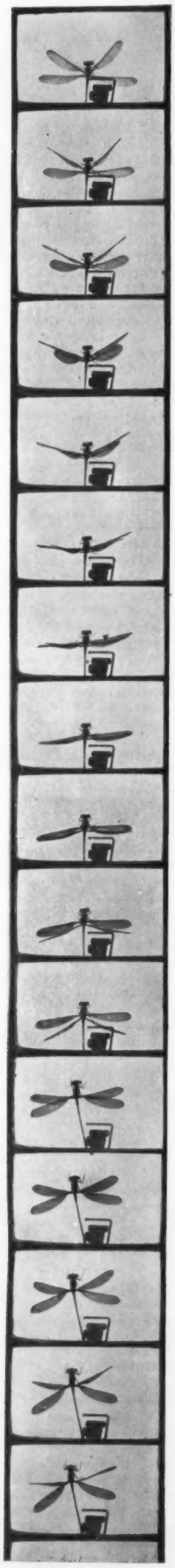
With a condenser of quartz, achromatized with Iceland spar, Bull obtained the very strong impressions shown in the accompanying illustrations. But the silhouettes of a moving insect obtained with this arrangement would be open to misinterpretation. In order to avoid this, Bull devised a stereoscopic camera by placing two objectives in front of the octagonal case, and using two spark gaps in the same circuit, so that two sparks are produced simultaneously by each interruption of the primary circuit, and two images of the insect are formed side by side upon the sensitive film. In order to prevent double exposures the apparatus is provided with a shutter, operated by electricity, which opens when the cylinder begins to turn and closes when a complete revolution has been accomplished. It will be observed that in this method, owing to the brief duration of the electric spark, no intermittence in the movement of the film and no closing of the shutter between successive exposures are required. The shutter, which is placed close to the film, consists of a brass plate having two square openings of the dimensions and mutual distance of the two stereoscopic pictures. A thin plate of steel covers these two openings, while the cylinder is at rest. Under the impulse of a spring, which is released by an electric current at the proper moment, the steel curtain drops and the series of pictures is impressed on the moving film. At the exact moment when the revolution is accomplished a second steel curtain, similar to the first, descends and closes the openings. The electric circuit of the shutter is independent of that of the spark coil.

The interval of time between consecutive images is measured by means of a tuning fork which makes fifty double vibrations per second and operates an electro-magnetic signal. This tuning fork is so arranged that the ends of its vibrating prongs are photographed during the experiment. By counting the number of photographs of the moving insect taken during an entire vibration of the tuning fork, the interval between successive photographs can be easily deduced. Furthermore, an operator with a trained ear can estimate the velocity of rotation of the apparatus with considerable accuracy by comparing the sound produced by the succession of sparks with the note produced by a tuning fork of known pitch. The accuracy of the results obtained by this method can be controlled by the photographic method described above, and the succession of pictures can be made with any desired rapidity. Finally, Bull places in the field of the lens a divided scale engraved on glass, by which the displacement of the insect in the field can be easily estimated. Having described the apparatus, let us see how it is employed in photographing the flight of insects. Bull regarded it as essential to give the insect entire liberty of movement during the experiment. In order to direct the flight in the field of the lens, he placed the apparatus near a window, because insects fly toward the light. The difficult problem of starting the mechanism exactly at the instant when the insect enters the field of view was solved by the following ingenious methods: In the case of flies and other Diptera the insect was held captive for a few seconds before the experiment, by means of an electro-magnetic clamp, attached to one leg. This clamp was intercalated in the circuit of the shutter, so that it liberated the insect exactly at the instant when the first steel curtain fell. For *Hymenoptera* (bees, wasps, etc.) and for other insects which hesitate before taking flight, another artifice was employed. The insect was confined for a very short time before the experiment in a glass tube with its open end cut obliquely and directed toward the light. The opening was covered by a hinged shutter of mica, kept closed by a very delicate spring, which also closed the electric circuit operating the camera shutter. The imprisoned insect, moving toward the light, pressed against and

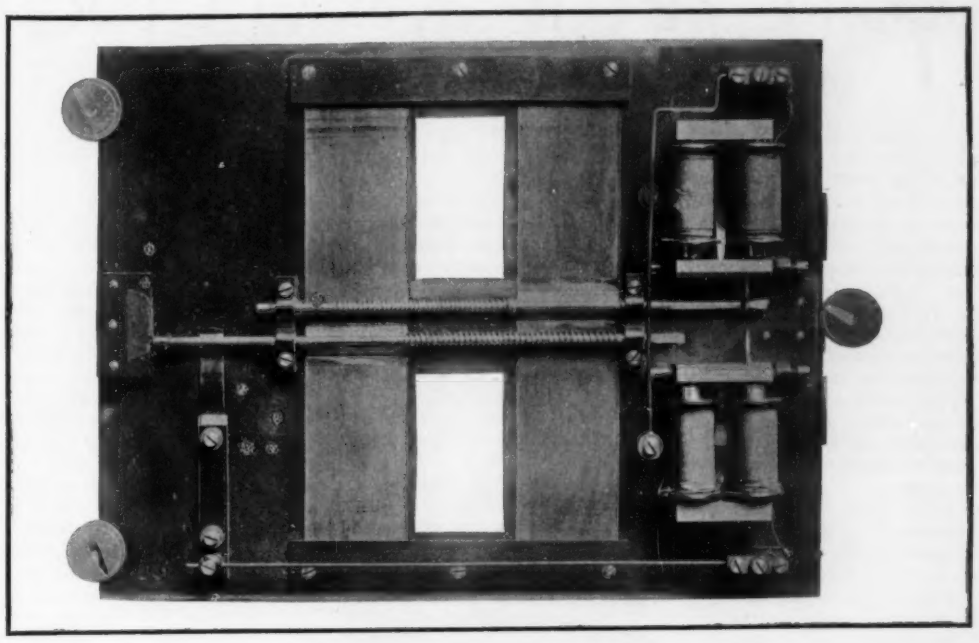
(*Concluded on page 95.*)



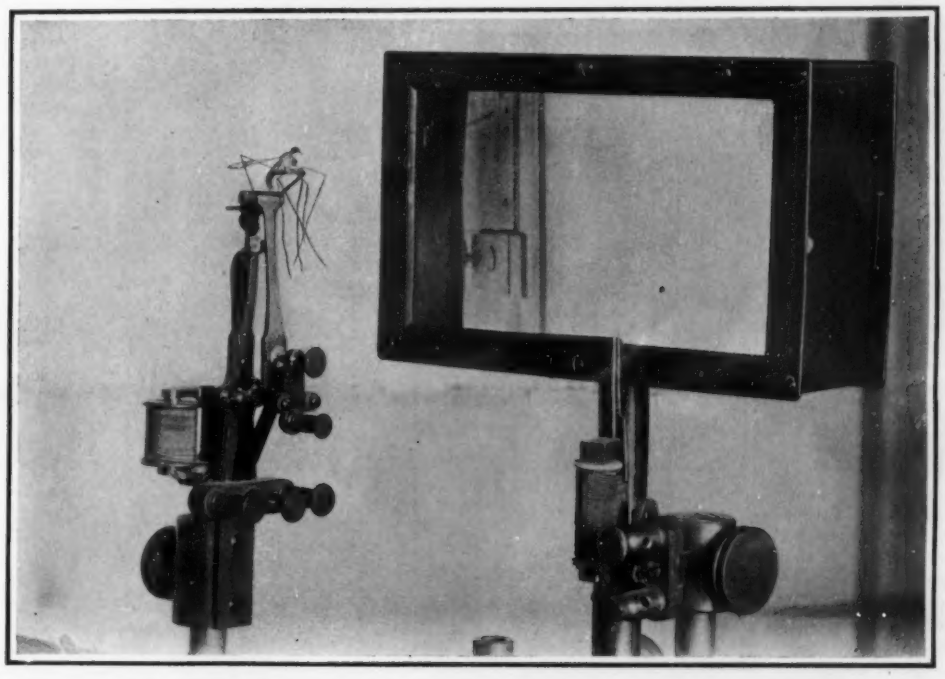
APPARATUS FOR MAKING MOTION PICTURES OF THE FLIGHT OF INSECTS.



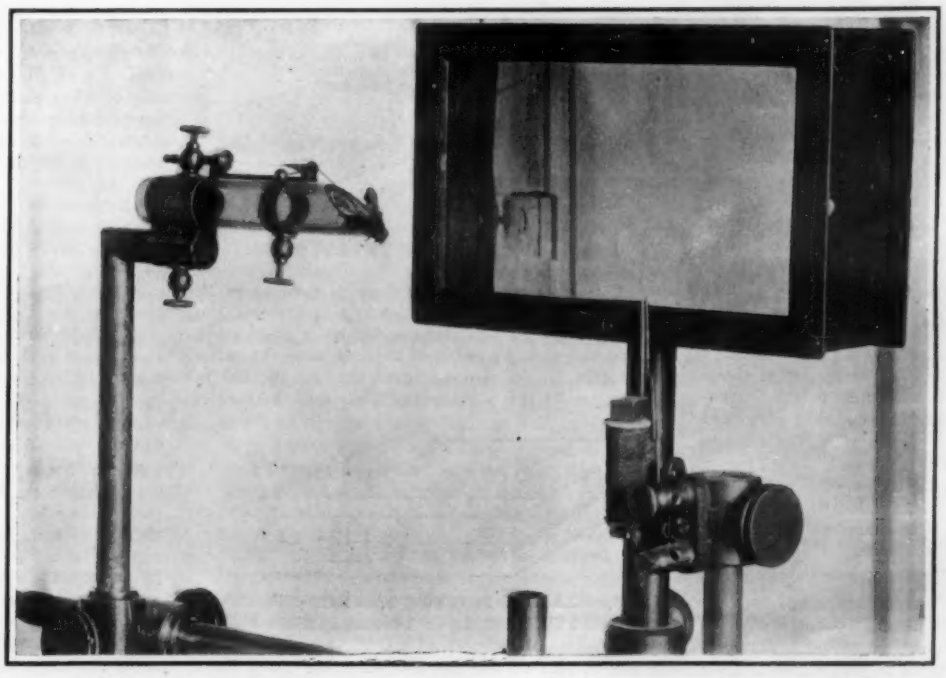
Strip of film, showing the flight of a dragon-fly.



The shutter of the stereoscopic camera.



A dragon-fly held captive before the camera by an electric clamp and released by the opening of the shutter.



A bee in escaping from a glass tube starts the motion picture apparatus by opening a mica door.

Strip of film, showing the flight of a fly.

MOTION PICTURES OF THE FLIGHT OF INSECTS.

MAGIC FOR AMATEURS—IV

TRICKS WITH COINS.

BY W. H. RADCLIFFE

NO. 8. THE FOOLSCAP MYSTERY.

The same principles are here involved as in Trick No. 1, but owing to the different garb in which they are clothed, few will recognize any similarity between them.

A small drinking glass *c*, Fig. 12, having pasted across its open end a piece of white writing paper of the same shade and texture as that upon which the trick is to be performed, constitutes one of the essential parts of the apparatus. The pasting is best done by applying mucilage lightly to the edge of the glass and then resting the glass upside down upon the paper which should be laid upon a smooth flat surface. When perfectly dry, the surplus paper should be trimmed closely to the edge of the glass. The paper cone or foolscap *c*, which should fit closely at its lower part around the glass *c*, is easily made with paper and mucilage. Although not absolutely necessary, the setting of the piece can be enhanced by the use of a picture frame *s*, from which the glass and supporting screws have been removed. The writing paper *m*, upon which the trick is performed, should be stretched tightly in front of the backboard of the frame, and the backboard fastened in place. A flat coin *n*, such as a dime, or a small unmounted picture, is now laid upon the writing paper, which may be either framed or not, as previously stated. The paper cone is then slipped over the glass, and the two are lifted together by pressing the fingers tightly about them near the table, and placed upon the coin or picture. After a few mysterious passes of the hands or wand over the cone, the latter is raised off the glass, and the coin or picture is found to have vanished. The paper covering of the glass, being indistinguishable from the paper surface beneath it, effectually hides the object from view. To bring back the coin or picture *n*, place the cone over the glass, repeat the passes and remove both glass and cone together, whereupon the object is again brought in sight. It is advisable before taking away the apparatus, to remove the cone from the glass and pass the cone around for examination. The prepared glass, however, should not be removed from its white resting place while in view of the audience.

NO. 9. A SUCCESSION OF SURPRISES.

Parts of different tricks can often be combined to form an effective trick differing in many respects from the original ones, yet embodying their principles advantageously. Take the "Disappearing Dime" trick No. 1, and the "Foolscap Mystery" trick described above. Place the apparatus used in both these tricks upon a single large sheet of white unruled writing paper. Select two dimes bearing the same date, and place one of them under the prepared drinking glass before giving the exhibition. After showing the other dime to the audience, place it on the white paper somewhat apart from the drinking glass and cover it with the prepared ring upon which rests the cardboard and unprepared ring. Then cover the drinking glass with the paper cone, and make some mysterious passes with the hands above the rings in the direction of the covered glass. Remove the unprepared ring and then the cardboard so that the spectators can see the dime has vanished. Lift both cone and glass together from their resting place and set them elsewhere on the paper. Below their original position will be seen the dime.

The applause will probably be accompanied by a request to repeat. Before doing so, show the date on the coin so that all will be convinced there is no deception.

Owing to the perplexing apparatus employed, it is usually safe to comply with the request by making the coin travel back to its first position. Then lay it, the same side down as the other coin, upon the paper and cover it with the prepared drinking glass screened by the paper cone. Readjust the ring structure above the first dime and repeat the hand manipulation, making the passes this time in the opposite direction. Upon lifting the paper cone off the glass, the dime is seen to have vanished, but is apparently found under the ring structure when this is removed to another part of the paper. Attention is called to the date on the coin which, of course, is the same as that on the dime previously shown the audience.

NO. 10. PASSING A COIN THROUGH A SET OF CLOSED BOXES.

In common with many of the other tricks here described, the apparatus for this one could not be purchased if one desired to do so, yet the result is as startling and impressive as in many five and six dollar professional illusions seen on the stage and elsewhere. A small baking powder can is employed to vanish the coin, which should be a dime marked by an onlooker for indentification. As shown in Fig. 13, the can has a slot *c*, just large enough to permit the coin to pass easily through. The slot is cut with its lower edge on a level with the inner bottom of the can. The set of boxes in which the coin is afterward found should consist of three or four small size flat pasteboard boxes, square or rectangular in shape,

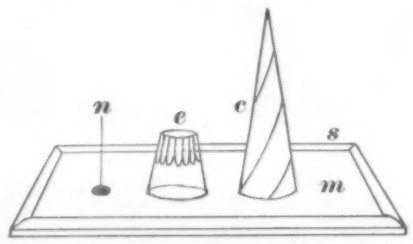


Fig. 12.—ACCESSORIES FOR USE IN A SIMPLE DISAPPEARING COIN TRICK.

and furnished with hinged covers. The smallest one need be no larger than necessary to hold the coin, but each succeeding box should be just large enough to hold the next smaller one. A strip of tin about one by one and three-quarter inches in size is bent into the shape shown in Fig. 14 to serve as a guide for the coin through the various boxes. This is inserted about one-eighth of an inch in the smallest box between the cover and the box proper, and three elastic rubber bands are wrapped around the box as indicated at *m*, *n*, and *s*, Fig. 15. This arrangement is inclosed by the next larger box, the tin allowed to project between the cover and the box, and the necessary tension secured by three elastic bands around the box as before. In like manner the remaining boxes are adjusted so that finally the prepared set of boxes appears as in Fig. 15. To pass the dime into the innermost box, it is merely necessary to slip it into the tin guide *a* inclined upward. Withdrawing *a* permits the respective sets of elastic bands on the different boxes to press down the covers and effectually bind them in a closed position. The performer commences the trick by coming forward with the tin can in his right hand, the bottom of the can in his palm and the slot at the right. He removes the cover with his left hand, and passes his wand around the inner part of the can turned upside down to prove there is nothing in it. He then requests that the marked coin be dropped into the can, after which he replaces the cover and shakes the box sidewise, so the audience can hear the rattle of the coin inside. He continues shaking the box in this way until the coin has slipped through the slot in the bottom of the can and into his right hand. Then with his left hand he places the can on a table apart from the set of boxes which, with the tin guide pointing upward, has been previously concealed behind a handkerchief on another table. Walking toward these boxes from the left, with the dime concealed in his right hand, the entertainer deliberately slips the coin into the tin guide, under cover of his left hand with which he holds the boxes, and withdraws the guide, letting it fall on the table. This movement will not be noticed if the performer explains that he was looking for a suitable cover for the can, but that as he cannot find one he will use a handkerchief instead. Bringing forward the handkerchief which previously served as a screen for his movements, he spreads it over the can, and then places the set of boxes near the covered can in full view of the audience. After explaining how he intends to pass the marked coin from the can to the innermost one of the series of boxes, each one securely bound with three rubber bands, he passes his wand from the can to the boxes. Then, removing the handkerchief he shows the can empty and hands the nest of boxes to the audience to be opened by them.

Fig. 13.—A BAKING POWDER CAN ARRANGED FOR MAKING COINS DISAPPEAR.

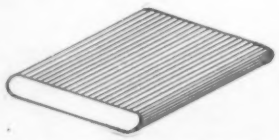


Fig. 14.—THE TIN GUIDE USED IN THE BOX TRICK.

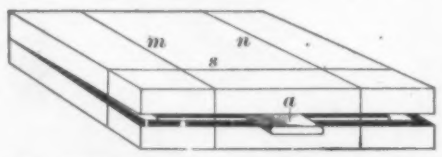


Fig. 15.—MEANS OF PASSING A COIN INTO THE INNERMOST ONE OF A SERIES OF RUBBER-BANDED BOXES.

The surprise created by the disappearance of the dime from the tin can and its reappearance in the innermost box of the set is still further increased when, by the marks of the coin, it is shown to be unmistakably the one at first placed by the audience in the can.

Science and the Atmosphere.

These are times when any, or indeed all, information concerning the air is eagerly sought after by those who are striving to attain mastery over its powerful forces. Upper and lower currents are becoming everyday expressions, and the students both of aerial navigation and wireless telegraphy are many. Studies of the air, and especially its relations to the conditions of the weather, were encouraged and fostered by the authorities of the Smithsonian Institution more than half a century ago. The everwise Henry aided with substantial grants the development of the new science of meteorology at that time, and the names of Coffin, Loomis, Ferrel, Abbe, and others are to be found among the list of authors whose papers found ready acceptance for publication in those early days by the Institution.

More recently came the substantial gift of Hodgkins having for its chief object the establishment of a fund for the prosecution of studies in the atmosphere. Langley's pioneer contribution to aerial navigation is scarcely a decade old, and therefore still fresh in the memory of us all. The study of the atmosphere requires not only a practical knowledge of the conditions that prevail in that medium, but also a knowledge of the laws in science that govern the movements of the currents, ever restless like the waves of the ocean, that move hither and thither exerting their wonderful influence upon our earth.

The most profound of our American students of meteorology—one who has devoted a lifetime to the study of that subject—is Cleveland Abbe, now senior professor in the service of the United States Weather Bureau. This distinguished scholar has gathered together in a volume of over six hundred pages some twenty-five papers, mostly translations of articles by learned meteorologists of Europe, which, with the title of "The Mechanics of the Earth's Atmosphere," has just been issued as No. 1689 of the Smithsonian publications. A summary of the contents of this volume would require many pages, and therefore it can only be said that the series of papers begins with Hadley's classic essay "Concerning the Cause of the General Trade Winds," with which our modern interest in the science may be said to have been inaugurated. Kerber's masterly study on "The Limit of the Atmosphere of the Earth," which has received so much attention from balloonists, is included, and nine papers by Von Bezold are among the valuable contents of this important volume.

An adequate index facilitating the finding of the more important topics mentioned in each of the essays brings the work to a close.

Steam heating for snow removal around switch points has been successfully employed, according to the Railway Age Gazette, in the Erie station at Jersey City. The installation is for twenty-six sets of points, and has been in service for three years. A 2-inch main is led from the power-house in the adjoining yard, and a 1-inch pipe to each switch. Two lines of pipe forming a loop are placed between switch sleepers under the points, the ballast first being removed. Automatic traps discharge the condensed water and thus prevent freezing. The snow melts as it falls, and no attention to the points is required. Throughout the severe winter of 1909-10 no difficulty was experienced, and a small force kept the pipe-lines and detector bars clean.

THE HEAVENS IN AUGUST

BY HENRY NORRIS RUSSELL, PH. D.

THE finest part of the heavens on an August evening is undoubtedly in the south, well down toward the horizon. Here we see the long curving line of Scorpio, the finest of the zodiacal constellations, and adjacent, on the left, Sagittarius. The principal configuration of the constellation—the small, inverted Milk Dipper—is very easily recognizable. The remaining stars can easily be identified with the aid of the map; but, as our initial shows, it is impossible to see in their arrangement any suggestion of the figure of the Centaur, armed with his bow, which has from ancient times been the accepted symbol of the group.

It is equally hard to find any sense or order in the way in which the Greek letters have been assigned to the stars of this constellation. Usually they follow the order of brightness—or occasionally that of position along some well marked line, like the tail of Scorpio—but here they are sprinkled about at random, Alpha and Beta belonging to two small stars in the southernmost part of the group, while the brightest of all bears the letter Sigma—the 18th in alphabetical order.

Far more interesting than these stars are the magnificent star-clouds of the Milky Way, far brighter than in any other part of the sky, which show a wealth of detail even to the naked eye, and when photographed with long exposures are found to be full of sharply defined masses, dark lanes and holes—which present one of the greatest puzzles of the skies. In some cases it seems as though we were looking through a gap between two clouds of stars to the empty space beyond; but in others the dark regions are so singular in shape, and so closely connected with visible nebulæ, that it seems possible—though by no means proved—that these nebulæ may be partially opaque, and nearer to us than the star-clouds, portions of which they hide.

A good example of such a region on a larger scale is conspicuous to the eye in Cygnus, a few degrees north of the bright star Deneb.

Here the Milky Way is crossed by a dark streak which immediately suggests a passing cloud. But, year in and year out, on the clearest nights, the dark region is there. Its origin must be in stellar space—perhaps in an actual thinning of the stars of the Galaxy, perhaps in the interposition of some cosmic cloud of overwhelmingly vast dimensions. It is reserved for the science of the future to find means to tell which is true.

This brilliant region of the Milky Way is also remarkable for many fine star-clusters and nebulæ, many of which can be found by sweeping with a field-glass from Aquila down to the horizon. Perhaps the finest with a small instrument is a star-cluster between λ Scorpii and δ Sagittarii conspicuous to the naked eye as a nebulous spot, and resolved into the separate stars by a field-glass.

Well up in the southeast is the bright Altair, and below its constellation of the Eagle is Capricornus, notable chiefly for the pretty naked-eye double Alpha, which has a distant companion almost opposite the closer one.

This double, though not as easy as the familiar Mizar in the Great Dipper, is easily separated by an ordinarily good eye. Those who wish rather severer tests may look at μ Scorpii (too low to be well seen except on a clear night), or Omicron Cygni—the southernmost of a pair of small stars half way between α and δ Cygni. If they succeed with these, they may try ε Lyræ (close to Vega, on a line toward α Cygni), which is too difficult for any but the sharpest eyes, but yields at once to an opera glass.

To the left of Capricornus is Aquarius, and then the great square of Pegasus. Higher up is the great cross of Cygnus, and between this and Aquila are the small groups of Sagitta, the Arrow, and Delphinus—the latter fairly conspicuous, and sometimes known as "Job's Coffin." Cassiopeia and Cepheus are in the northeast, Ursa Major and Draco above the Pole, and Lyra, with the resplendent Vega, directly overhead. In the northwest is the Great Bear, and in the west Virgo (beginning to set) Boötes, Corona and Hercules near the zenith. The small group of Libra, in the southwest, and the great one of Ophiuchus above it, complete our survey.

THE PLANETS.

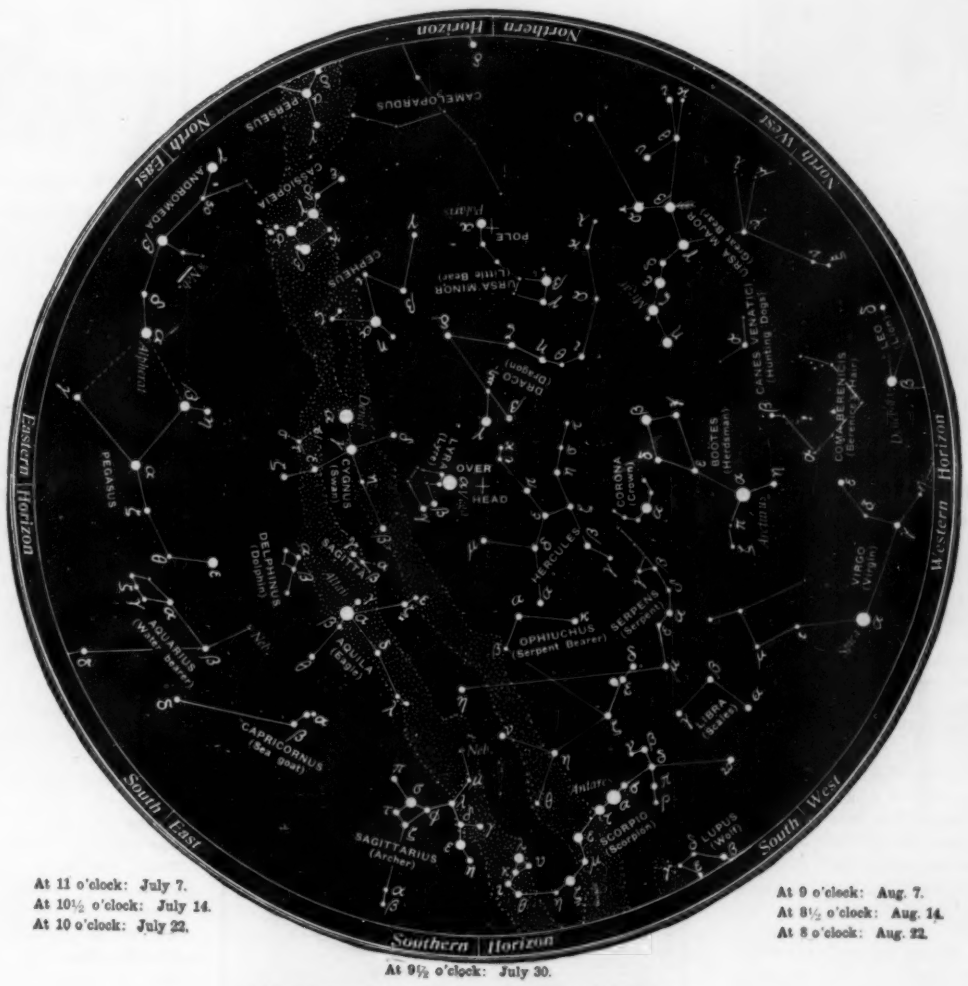
Mercury is evening star all through August, setting about an hour after the sun. He is at his greatest elongation east of the latter on the 30th at a distance of 27 deg., but being considerably south, is not very favorably placed. On the evening of the 4th he is about 1 deg. north of the bright star Regulus. The two should be a pretty sight in the twilight about 7:30 P. M., especially as Mars is very near them.

Venus is morning star in Gemini and Cancer, rising about 2:45 A. M. on the 1st, and 3:35 on the 31st. Though less than half as bright as she was in April, she still far exceeds any other planet. Mars is evening star, but is visible only at the beginning of the month. He passes even closer to Regulus on the 3rd than Mercury does the next day, and the two planets are in conjunction on the 5th with the crescent moon near by. After this he soon gets so near the sun that he is practically invisible. Jupiter is evening star in Virgo, setting at 9 P. M. in the middle of the month, and is the brightest thing in the evening sky.

Saturn is in Aries, rising about 10:15 P. M. on the 15th, and observable through the morning hours. Uranus is in Sagittarius, his position on the 14th being 19 hours, 36 minutes R. A., 22 deg. 8 min. south declination, which puts him midway between the bowl of the Milk Dipper and β Capricorni. Neptune, which was in conjunction with the sun only last month, is observable before dawn. On the morning of the 11th he is about half a degree southeast of Venus, which may aid in finding him.

The Moon is new at 1 A. M. on the 5th, in her first quarter at 9 P. M. on the 12th, full at 2 P. M. on the 20th, and in her last quarter at 3 A. M. on the 27th. She is nearest us on the 24th, and farthest away on the 12th—her actual distances on these two dates being 229,000 and 251,000 miles. She moves so much slower at the greater distance from the earth that it takes her more than a day and a half longer to go from new to full than back to new again.

In her circuit of the heavens she passes near Venus on the 2nd, Neptune on the 3rd, Mars and Mercury on the 6th, Jupiter on the 9th, Uranus on the 17th, Saturn on the 25th, and Neptune again on the .30th. The conjunction with Saturn is close, but occurs while the planet is below our horizon.



At 11 o'clock: July 7.
At 10½ o'clock: July 14.
At 10 o'clock: July 22.

At 9½ o'clock: July 30.

At 9 o'clock: Aug. 7.
At 8½ o'clock: Aug. 14.
At 8 o'clock: Aug. 22.

NIGHT SKY: JULY AND AUGUST

The Army and Its Stomach.

That an army travels on its stomach is evidenced by the fact that tests are being carried on by the War Department to produce a kitchen wagon for use of troops. Such a wagon has been built with facilities for roasting, boiling, and stewing for at least 450 men. The equipment of the wagon, without water and food, weighs a little over a ton. It is expected that this weight can be further reduced in other wagons to be built. This wagon carries a stove and a hot water boiler. The stove has a boiling capacity of 80 gallons and a roasting capacity of 100 pounds, sufficient for two companies. In addition to this equipment, there are two sets of fireless cookers placed in the rear of the wagon, both of which have a capacity of 50 pounds for roasting and 40 gallons for boiling. Each company has two kettles for boiling and one for roasting. When the food is cooked the commanding officer sends a detail of men to the wagon to get the company kettles and roaster, thus doing away with the objection to a battalion mess.

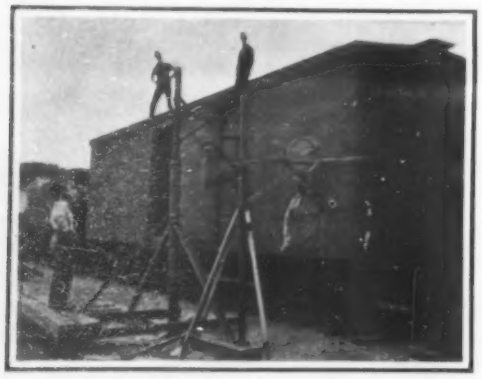
Following out the plan to make the rations for the man on foot of a tasty kind, and to give him a variety of bread while in the field, a new soft bread has been prepared by the subsistence officers, which promises to eventually do away with the old style hardtack. The new bread is intended as a substitute for hardtack, and it is thought will keep as long a time. The keeping qualities have been demonstrated. It will keep in good condition for more than four months. The commissary-general has been so confident that the new bread will prove a success that he has taken up the matter of the form of loaf or biscuit to be adopted. It is thought that some form should be selected that will be conveniently carried in the haversack, and at the same time will conform in shape to the commercial biscuits and loaves now in use. It is also expected that these experiments in the army will develop a new bread which will be suitable for use by hunters, miners, yachtsmen, and others who, by reason of long distances from base of supplies and facilities for baking, must rely on the supply carried.

According to a contemporary, compressed air for signaling from the bottom of shafts to the hoisting engine-room at the surface is used at the Moodna pressure tunnel of the Catskill Aqueduct. An air pipe extends up the shaft and into a cylinder alongside of the hoist runner; in this cylinder is a metal piston or plunger which strikes against a gong when pressure is applied.

CURIOSITIES OF SCIENCE AND INVENTION

MAIL-BAG EXCHANGING MECHANISM FOR RAILROADS.

A test was recently made on the Central Railroad of New Jersey of an ingenious mechanism for delivering mail bags to and from a rapidly moving train. The accompanying photograph shows the mechanism in operation. In the foreground is a mail bag suspended from a bracket mounted on a post alongside of the track. Immediately beyond this post is a second one provided with a receiving bracket. Similar brackets are mounted on the freight car. In each case the mail bag is provided with a ring formed of two hinged and overlapping sections which are kept in closed position by the weight of the bag. The ring is supported in a socket on the bracket, which is also formed of

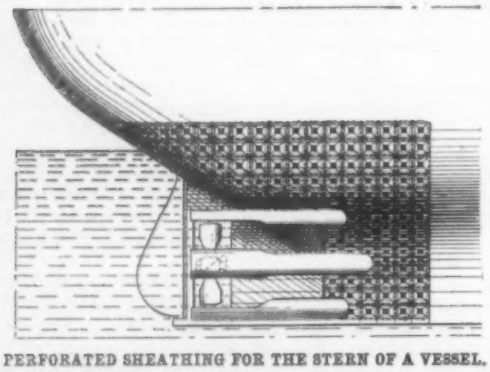


AN EXCHANGE OF MAILBAGS. TRAIN MAKING 30 MILES PER HOUR.

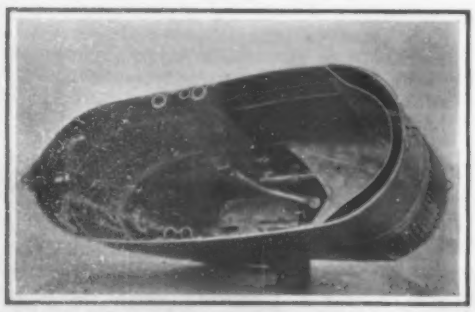
two sections held in closed position by the weight of the bag. The receiving bracket is formed with an upwardly-inclined bar adapted to lift the ring with the bag off its socket. The inclination of this bar is sufficient to retard the bag which, when it reaches the top of the incline, slides down another inclined bar at right angles to the first. It may then be removed from the receiving bracket by opening the hinged sections of the ring. In the test referred to, exchanges were made with bags filled with stone and paper, weighing 100 pounds and 50 pounds. The speed of the train was between 25 and 30 miles per hour, and the exchange was effected without mishap.

METHOD OF RELIEVING SUCTION AT THE STERN OF A VESSEL.

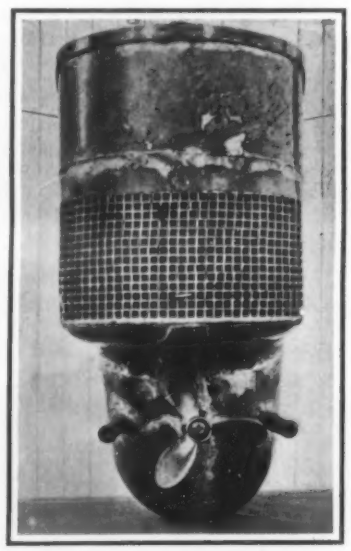
In the wake of every moving object there is a partial vacuum or rarefaction of the fluid through which it is moving. In the case of a steamer travelling at high speed, the tendency to produce a cavity at the stern causes a rush of water toward this part of the vessel, which sucks it down and forms a serious drag. To overcome this drag and to permit the vessel to ride on an even keel, an inventor has recently devised a scheme of introducing air at the stern of the vessel, his idea being that since air is less sluggish or dense than water, it will more readily flow into the cavity at the stern of the vessel and thus reduce the drag. With this in view, an experimental model was constructed, two photographs of which are reproduced herewith. The stern is formed with a double wall, the space between the two walls being open to the atmosphere and the outer wall being perforated. This model was operated in a tank, and it was found that there was an actual reduction of the amount of power required to drive it than when the air supply was cut



PERFORATED SHEATHING FOR THE STERN OF A VESSEL.



MODEL USED TO DEMONSTRATE METHOD OF RELIEVING SUCTION.



STERN OF MODEL SHOWING PERFORATIONS.

off. The accompanying line drawing illustrates a novel form of sheathing which the inventor proposes to apply to the stern of any vessel. The construction of the sheathing is such as to admit the air between it and the hull of the vessel, and to feed it out through a large number of square openings with beveled sides so as to relieve the drag of the water.

RECONNOITERING FROM AN AEROPLANE.

In order to demonstrate the availability of the modern biplane for military reconnoitering, two infantry officers of the French army, Capt. Marconnet and Lieut. Féquent, were detailed by the Ministry of War to fly from the camp at Châlons to the military aviation grounds of Vincennes (Paris), and to report with photographs of the terrane over which they had flown. Lieut. Féquent was to pilot the machine, and Capt. Marconnet was to act as the commander of the biplane, as well as the observer. The flight was to take place on June 8th, 1910, but had to be postponed on account

FRENCH AVIATOR SCOUTS.

The deafening motor makes speaking tubes necessary.

of foggy weather. On the 9th of June, at 4:40 P. M. a Farman biplane with the two officers started on its journey.

Since the pilot had all he could do to control the machine, Capt. Marconnet had to take the barometric readings, work the camera and keep track of the chart, indicating the route to be followed. On account of the deafening noise of the motor, the two officers communicated with each other by speaking horns and tubes. A special transmitting and receiving apparatus was devised, which was strapped upon the head and shoulders of the pilot.

A height of 1,600 feet was attained and a speed of about 35 miles an hour. At ten minutes after 7, the aeroplane alighted at Vincennes.

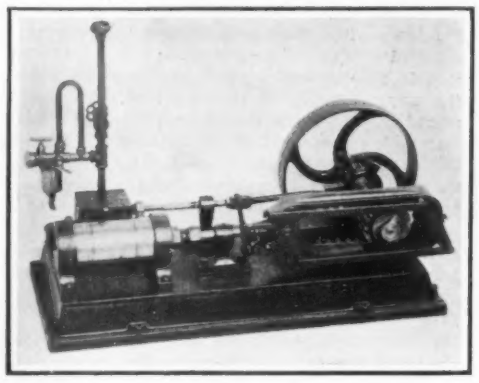
Capt. Marconnet reports that the military utility of the biplane is not to be underestimated. In his opinion, the commander of an army corps could easily be kept informed of an enemy's movements within a radius of 50 miles.

Capt. Marconnet is shown in our photograph using a map wound on two cylinders so that he can roll it from one to the other. The back of Lieut. Féquent serves as a support.

The photographic apparatus, to which reference has been made, was fixed below the seat. It seems that excellent photographs were taken of the terrane covered.

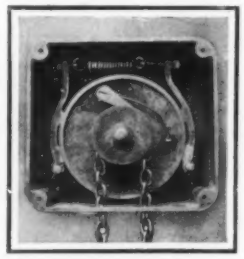
RACK AND PINION SUBSTITUTE FOR A CRANK.

A very unique method of connecting a piston rod to a driving wheel without the use of a crank is illustrated in the accompanying engraving. The piston



A UNIQUE CRANKLESS ENGINE.

rod terminates in a rack frame in the form of a yoke through which the shaft of the driving wheel passes. On this shaft are two pinions, arranged side by side. The rack is formed with teeth on its upper surface to engage one of the pinions, and with teeth on its lower surface to engage the other pinion. As the rack is reciprocated motion is transmitted first to one pinion and then to the other pinion of the shaft, so that the shaft always turns in the same direction. The mechanism for shifting the connection from one pinion to the other consists of a small rocker placed in a recess in the shaft which bears against the ends of two keys so that it alternately forces one or the other into engagement with its respective pinion. At each end of the rack frame there is a rock shaft carrying two pins, one of which is always in position to reach through an opening in one of the pinions and press the key out of engagement, thus at the same time rocking the other key into engagement with the other pinion. The two rock shafts are connected by links, and while one is rocked during its contact with one pinion, it serves to move the other rock shaft into position to operate on the other key at the end of the next stroke. The motion is reversed by shifting the rock shafts so as to bring another pair of pins into play.



FRICTION BRAKE OF THE HOIST.

HOIST FOR FIRE-ESCAPE LADDERS.

On the East Side of New York, where boys are always on the lookout for plunder, it frequently happens that the ladder used to connect the lowest platform of the fire escape with the street is stolen and sold for junk. For this reason, in time of fire this means of escape is cut off. If the ladder has not been stolen, it is usually drawn up and so securely fastened as to be unavailable in an emergency, and at any rate it is too heavy to be operated by a woman or child. For this reason, a device has recent-

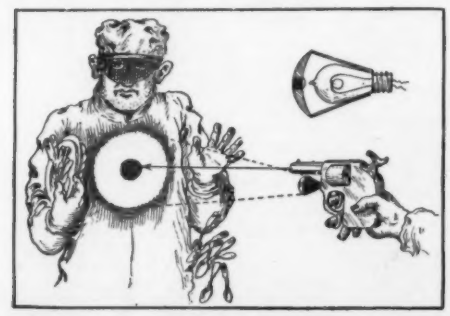
FIRE ESCAPE LADDER HOIST.

ly been introduced whereby the ladders, while normally raised, may readily be lowered into a position for use by pulling a chain, and when desired may be hoisted up again to the normal position. The hoist, as shown in the accompanying engraving, consists of a chain pulley connected by a ratchet to a drum against which a friction brake bears. When lowering the ladder the friction of the brake counterbalances the weight of the ladder, but when hauling the ladder up the pulley is disengaged from the brake drum and the operator has merely the weight of the ladder to raise.

TWO NOVEL FOLDING BOATS.

The advantage of a life raft over a life boat lies the fact that the former occupies less storage space, compared to its capacity, than the latter. On the other hand, the ordinary raft, if loaded to its rated capacity, is far more liable to upset in rough water than the life boat, and is otherwise unmanageable. In order to render life boats less bulky, an inventor has devised a folding boat, which is illustrated in the accompanying engravings. The flat bottom of the boat is hinged along the center and the sides of the boat are hinged to the stem and stern posts, so that the boat may be folded perfectly flat, as shown in one of the photographs, and can be stowed away in a minimum of space on board ship. The boat may be extended into position for use by merely operating a winch at one side. This serves to press the bottom down while the sides are extended by means of a pair of cross braces hinged at one side and provided with rollers at the other bearing against plates on the gunwale. Every precaution has been taken to make the joints perfectly watertight by the use of rubber gaskets and mortise connections.

Mr. Joseph Vaghi, of Bethel, Conn., to whom we are indebted for the accompanying illustrations, is also the inventor of another novel folding boat, which may be made into a neat parcel for portage or may be built up into a tent to provide a shelter at night. The main body of the boat comprises a lazy tongs construction, over which waterproof canvas is stretched. For the prow of the boat two rods are used which serve as stretchers for a hammock when the boat is converted into a tent. The oars of the boat are employed as uprights or posts in the tent, and the sides of the tent are enclosed by a length of waterproof fabric which may be attached to the roof section supported by the lazy tongs.

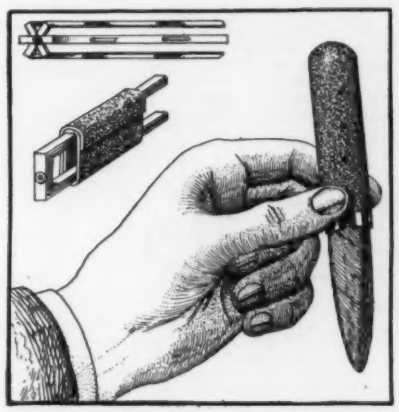


ILLUMINATED FINDER FOR SHOOTING AT NIGHT.

PATENTED ODDITIES.

ILLUMINATED FINDER FOR SHOOTING AT NIGHT.—A recent invention provides a small electric lamp which may be fitted immediately below the barrel of a revolver and which is illuminated as soon as the trigger is slightly pressed. Directly in front of the lamp is a lens adapted to concentrate the light in a beam, and at the center of the lens is an opaque spot which produces a shadow spot or "bull's eye" at the center of the surface illuminated by the lamp. The lamp is so adjusted that this shadow spot represents the exact aim of the revolver. Anyone provided with a revolver of this sort would be able not only to throw a light on an intruder in his home, but would be able to adjust his aim carefully.

CIGAR PROTECTOR.—The ashes of a cigar often prove annoying, not only indoors, where they are liable to fall on carpets and furniture, but also out of doors, when the wind is liable to blow the ashes in one's face or upon the clothing. To overcome this fault, an inventor has provided a cigar protector which consists



DEVICE FOR RETAINING CIGAR ASHES.

Using the roof of the tent as a boat.

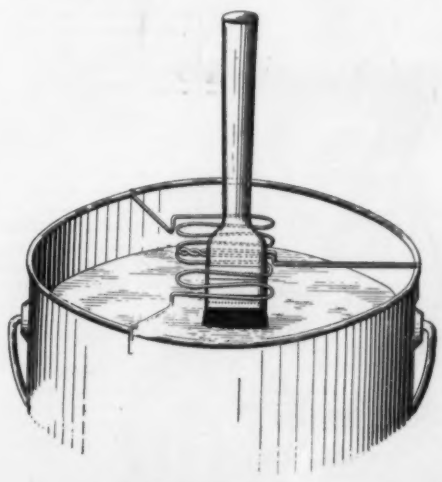
Life boat ready for use.

Above: life boat folded. Below: boat converted into tent.

TWO NOVEL FOLDING BOATS.

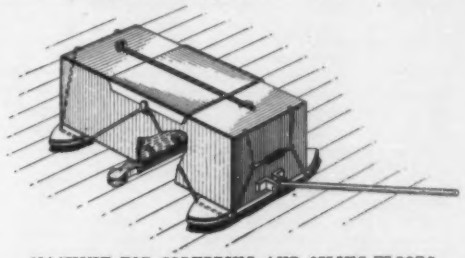
of a framework, over which a bag of flexible and incombustible material is stretched. When not in use the framework may be folded and the bag removed and wrapped about it to form a small, flat package, which may be slipped into the vest pocket.

PAINT-BRUSH HOLDER.—The accompanying drawing illustrates a very simple device adapted to suspend a brush in a paint pail so that the bristles will be submerged in the paint and thus be prevented from drying. It consists of a wire frame adapted to be supported on the top of the pail, and bent back upon itself a number of times to form fingers between which the paint brush or brushes may be secured at any desired point.



PAINT-BRUSH HOLDER.

SCRUBBING MACHINE.—In order to provide a more convenient method of scrubbing floors than the back-breaking operation that now prevails, an inventor has improvised a scrubbing machine which consists of a pair of scrubbing brushes secured to a long handle and supporting a receptacle for water. A valve is provided at one side, which may be operated by the foot to regulate the feed of the water. If desired, the brushes may be removed and replaced with rubbing or polishing devices and the reservoir may be filled with oil, if it be desired to oil the floor.



MACHINE FOR SCRUBBING AND OILING FLOORS.

Brief Notes on New Inventions.

An inventor hailing from Kansas has hit upon the very ingenious scheme of making cattle do their own pumping when they wish a drink of water. The path that leads up to the watering trough terminates in a treadmill, which is connected by suitable gearing to the pump. As the treadmill offers the only means of access to the trough, the animal is obliged to operate the pump while it is taking a drink. One of the advantages of this system is that each animal is assured of having fresh water to drink. A valve is provided which discharges the water automatically when the animal leaves the treadmill.

In stormy or cold weather, automobilists find riding uncomfortable unless they can protect their faces from the rain or wind. An inventor has just devised a novel coat for the use of automobilists, which has a very deep collar. When folded this collar looks like an ordinary one, but it may be turned up to fit snugly around the neck and, if so desired, farther turned up, to completely eclipse the head of the wearer, in which position it is held by means of a strap passing over the top of the head. Two glazed openings in the collar allow unobstructed vision, and in addition to this, there is a screened opening to cover the mouth, and two screened openings opposite the ears.

It has been demonstrated that the crew of a submarine torpedo boat may escape through the torpedo tube in case the boat should sink and be unable to rise, provided there is some one to operate the mechanism. This makes it necessary for one man to sacrifice himself for the safety of all the rest. In order to permit this last man to escape, an attachment has been invented which may be previously set and adjusted to operate the torpedo tube mechanism automatically.

A German inventor has just patented a novel shoe which, at the toe portion, is provided with partitions which pass between the toes of the foot. These partitions terminate in soft pads designed to bear against the foot at the base of the toes, so that the thrust will be taken at his point, and not at the end of the toe. By this arrangement, he seeks to prevent deforming of the feet, which now is common, due to the jamming of the toes of the foot into the toe of the shoe. The shoe is thus virtually converted into a sandal, in which the foot is entirely concealed.

RECENTLY PATENTED INVENTIONS.

Electrical Devices.

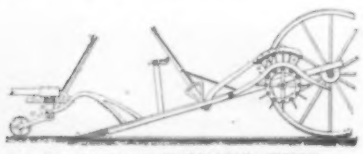
APPARATUS FOR SUBMARINE SIGNALING.—T. J. Bowlker, Boston, Mass. In this invention the more particular object is to enable the operator to determine accurately the direction of sounds received. The inventor takes advantage of the fact that in water, as well as in air, different portions of the sound wave reach different objects at different moments, and that the interval of time elapsing between the arrival of a sound wave or group of sound waves at one point and the arrival thereof at another point in close proximity to the first, may be an indication from which the sound wave arrives.

Of Interest to Farmers.

HUMIDOR.—G. H. Lee, Omaha, Neb. Among the principal objects in view in this invention are to provide a humidor for supplying moisture to heated air, and to provide a device for regulating the amount of moisture given off. In placing the humidor within the chamber, care is taken that the scale shall be presented to the door of the chamber and that the handle is placed in a position readily accessible from the open door of the incubator.

SEED-SOWING ATTACHMENT FOR CULTIVATORS.—R. Griswold, Livingston, Wis. This invention is an apparatus adapted for easy attachment to and detachment from the frame of a cultivator or other wheeled machine, for use in scattering any small seed, such as rape, turnip, or grass seed, which is ordinarily sown at the last cultivation of the corn crop.

WEED ERADICATOR.—Henry Melvin Johnson, Box 155, Nome, N. D. The machine is particularly adapted for the removal of such weeds as grow along the ground, and are attached thereto by a series of roots. The



MACHINE FOR ERADICATING WEEDS.

roots of these weeds are not deep, hence the machine operates to elevate the entire upper layer of the ground and separate the weeds from the earth, so that they are scattered and destroyed by becoming dried.

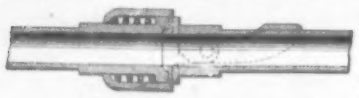
ADJUSTABLE HARROW-TOOTH. — A. Brigden, Albertville, Ala. In this patent the invention has for its aim the provision of a tooth which may be lengthened or shortened to suit conditions, and which when adjusted will be held firmly in position, without the possibility of longitudinal or lateral movements of the parts with respect to one another.

Of General Interest.

GARBAGE-CREMATORY.—W. K. Herbert, McKeesport, Pa. The improvement relates to a crematory for use in destroying garbage and other refuse. The invention consists broadly in a storage and drying chamber, an incinerating chamber, an auxiliary combustion chamber, and means to deodorize and cleanse the combustion gases.

MUSIC-LEAF TURNER.—T. S. Grose and J. W. Hawkins, Philadelphia, Pa. The purpose of the invention is to provide details of construction for a leaf turner which is well adapted for successively turning the leaves of a bound book, or loose leaves whereon different pieces of music are imprinted, and thus relieve the player of a piano or the like from interruption while executing music on such an instrument.

PIPE COUPLING.—Valentine S. Perazio, 804 Eighth Avenue, New York, N. Y. This coupling is adapted for general use, but more especially for coupling pipes on automobiles. It requires no wrenches, and prevents the common evil of twisting the pipe, which so often produces leaks. It may also be used where a



SIMPLE COUPLING FOR PIPES.

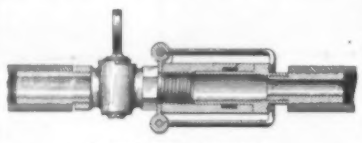
lack of space prevents the use of a wrench. The pipe sections are provided with flanged heads, and over one of them is a spring-pressed sleeve on which is hinged a yoke lever formed with cam faces adapted to bear against the flange of the other section and thus lock the two together.

FRUIT-BOX PRESS.—L. M. Cox, near Toppenish, Wash. This inventor provides a press for holding boards and cleats for the tops of boxes or crates to be placed in position and there held for nailing; a press which will maintain the parts to be nailed on a box independently of handling by the operator, thereby leaving the mechanic free to use both hands in nailing; a press which accommodates within wide radius various sizes of boxes; and a press wherein the box structure is squared before the top is secured thereto.

HORSE-OVERSHOE.—A. Boyd, New York, N. Y. In this patent the invention has reference to horse overshoes, the more particular purpose being to provide an overshoe detachably connected with the ordinary horseshoe and with the hoof, in such manner as to partially inclose the same. On merely loosening a strap the horse's foot is extricated from the overshoe.

ORE-SIZING APPARATUS.—C. P. Watterson, McGill, Nev. In this instance the aim of the invention is the provision of a new and improved ore-sizing apparatus, arranged to insure a separation of the material into different sizes, and to allow of treating a large amount of material in a given time and at a comparatively little running expense.

PIPE COUPLING.—William H. Goss, Stonington, Maine. The coupling device consists of two telescoping members, one of which is formed with an interior annular recess adapted to receive a gasket which fits snugly against the other member and prevents leakage. The two members are interiorly threaded



HANDY PIPE COUPLING.

to be screwed on to the nipples with which the two sections of hose that are to be coupled are provided. The two sections may then be connected by telescoping the two members and locking them fast by means of a pair of latches. The coupling is thus accomplished without the use of tools.

VAGINAL SYRINGE.—Ida L. Stevens, St. Louis, Mo. The invention provides a syringe embodying details of construction which adapt it for very convenient service, facilitate the introduction of medicament in either liquid or powdered form, prevent an improper escape of liquid while in use, render the instrument extremely simple, enable the quick and easy separation of parts to permit their renovation and provide a sanitary device at moderate cost.

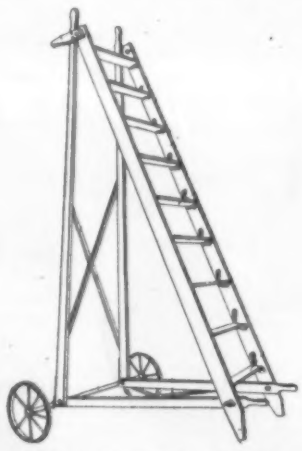
TUNNEL-SUPPORT.—C. C. Finlayson and J. N. Cain, Bisbee, Ariz. In the present invention the object is to provide an improved form of drift support for mining purposes, which will be strong, durable and economical in construction, which will consist of few parts, and which may be cheaply constructed, and will require no change in the usual methods of mining.

WATER-PURIFIER.—F. Dinghaus, Puerto Barrios, Guatemala. The invention relates to improvements for removing impurities such as lime and sediment from water which is designed to be used subsequently in a boiler for producing steam. An object is as stated above to remove lime and sediment from water and use is made of rays of light for accomplishing this purpose in connection with the apparatus.

Hardware and Tools.

FASTENER FOR DOORS, SHUTTERS, AND THE LIKE.—M. Dessauer and S. Baruch, New York, N. Y. This invention relates more particularly to construction and arrangement of parts whereby the bolt is withdrawn to inoperative position. For fastening a door or other closure, the bolt is so mounted that it cannot be broken or displaced by pressure from the opposite side of the door, and a bolt or brace-lifting or withdrawing means is provided so that it cannot be operated save upon insertion of a key, and this after insertion to release controlling means operates as the handle for operating the controlling means and lifting the bolt.

LADDER.—H. A. Sager, R. D. No. 3, Missoula, Mont. This ladder is adapted to be arranged in a plurality of positions, whereby the height can be varied, and has steps or rungs movable into a plurality of positions.



LADDER MOUNTED ON A TRUCK.

The ladder is strong and durable, inexpensive to manufacture, can be easily moved from place to place, folded into a compact form for storing or shipping. While the ladder is particularly useful in orchards and the like in harvesting fruit or other produce, it can be advantageously employed for other purposes.

MEASURING INSTRUMENT.—I. B. Hagan, Sr., Lamoine, Maine. Mr. Hagan's invention relates to instruments for use by those desiring to measure angles, and it embodies several novel features of construction, which produce a more serviceable device than those hitherto known. When the several parts and the protractor members have been arranged, an angle rule is moved to or from the base, which decreases or increases the angle which may be determined by examination of the scales, as it is well known by those familiar with the art.

Heating and Lighting.

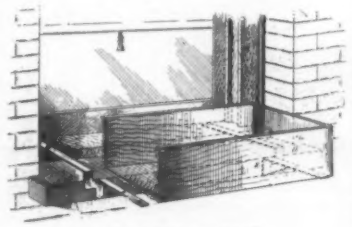
HOLLOW METAL FURNACE-GRATE.—T. J. Walton, Springfield, Tenn. One of the objects of the invention is to provide a grate which can be connected up with registers and pipes leading to adjoining rooms, so that the last may be heated by means of air to which heat has been imparted in coming in contact with the top, back, sides, and bars of the grate, on the opposite side from the fire.

Household Utilities.

EGG-BOILER.—C. B. Martin, Portland, Ore. This inventor has for his object the provision of an automatic egg boiler which has a vessel pivoted at one side of its center of gravity, to which the eggs are secured, with an improved valve to permit the water to run into the vessel to rotate it at a predetermined time, and thereby lift the eggs above the water.

SIPHON-VALVE.—F. Lutz, New York, N. Y. Mr. Lutz's invention more particularly relates to siphon valves for water-closets and the like, and has for an object the provision of a valve for quickly creating a siphon for flushing purposes, which valve is durable and the action of which is simple and efficient.

WINDOW BOX SUPPORT.—Mrs. Jennie S. Newgarden, 527 West 135th Street, New York, N. Y. In order to permit of supporting a window box upon a window sill so as to permit the box to extend outwardly from the sill,



WINDOW BOX SUPPORT.

and yet be accessible at all times from within the window, two brackets are provided, to which the box is bolted. The brackets are formed with a vertical portion adapted to bear against the face of the stone sill, and an extension which may be screwed to the wooden sill of the window.

FAUCET.—V. Retisky, New York, N. Y. The purpose here is to provide a faucet more especially designed for use on bath tubs, wash basins and similar articles, and arranged to permit of conveniently drawing hot and cold water separately, or the two together, to form lukewarm water of any desired degree of temperature.

Machines and Mechanical Devices.

WARPING-MACHINE.—F. L. Atherton, Paterson, N. J. The intention in this case is to provide a machine more especially designed for the preparation of warps for silk and other goods, and arranged to insure the formation of even warp sections, in which the threads are not liable to creep one on the other and leave section marks in the final weave.

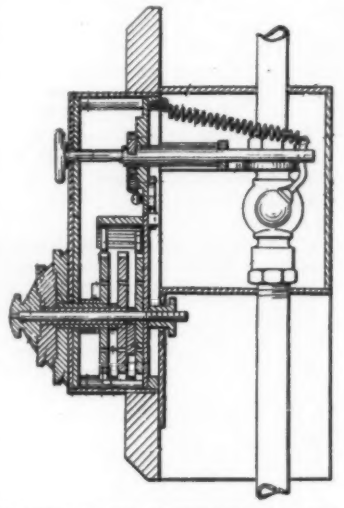
TYPE-WRITER KEYBOARD.—M. Trejos, San José, Costa Rica. The improvement provides an arrangement of the keys for operating a typewriter conforming to the natural arrangement of the thumbs and fingers when resting in an extended position; provides an arrangement of extra or special keys disposed between the double banks of the usual keys; and provides spacing and shifting keys disposed with reference to convenience for operation by the thumbs of the operator.

SELF-CLEARING SEGMENT FOR LATHES.—J. P. Reneker, Logansport, Ind. This invention refers to lathes for heavy work, and more particularly to center driven car wheel lathes of the Pond type and in which a car axle is temporarily secured within the axial center of a worm wheel for the purpose of supplying power to the axle in order to cause the rotation of the car wheels and axle relatively to the cutting tool.

DRILL-CHUCK.—H. W. Fuller, Hachita, New Mex. The device is operated by air or steam pressure, the piston being provided with a longitudinal passage for conducting the fluid to the chest or cylinder in which the piston reciprocates, such fluid acting upon a movable chuck arranged in the other end of the piston, whereby when subjected to pressure it fastens the drill, and when pressure is removed, the drill is in turn released.

Prime Movers and Their Accessories.

ATTACHMENT FOR CONTROLLING THE FUEL-SUPPLY OF INTERNAL-COMBUSTION ENGINES.—Gustav and Frank Deeg, 444 Evergreen Avenue, Brooklyn, N. Y. In this



ATTACHMENT FOR CONTROLLING THE FUEL-SUPPLY OF INTERNAL-COMBUSTION ENGINES.

instance the inventor has in view a mechanism for use in controlling the valve of a conduit, more especially the valve of the gasoline supply pipe leading to an internal combustion engine, particularly when the engine is used as a propelling engine of an automobile or motor-boat.

FLUID-MOTOR.—A. Kelso, Pittsburg, Pa. This invention relates to a motor of the reciprocatory rotary type to be operated by any suitable fluid, such as water under a head. The device has a rotary element, with means for automatically reversing the rotation of the element. It has a reciprocatory rotary element with means for supplying an operating fluid to either side of said element, and means for sharply reversing the flow of said fluid.

Railways and Their Accessories.

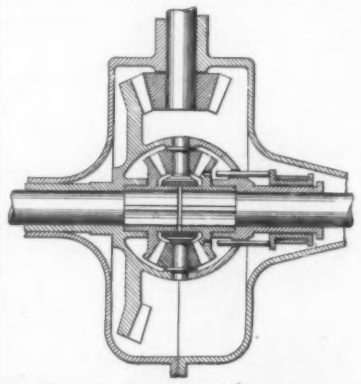
RAILROAD CROSS-TIE.—J. Gearon, Sr., Chicago, Ill. The object here is to produce a tie of laminated material, in tabulated form, and more particularly to construct a tie that is hollow and formed of a sheet of plate metal and a sheet of fibrous or other suitable pliable material, lapped or wrapped together in alternate plies and consolidated by applied pressure that gives proper form to the composite tie.

Pertaining to Recreation.

MERRY-GO-ROUND.—F. C. Angwin, Parkville, Victoria, Australia. This invention pertains to merry-go-rounds, and the object is to provide one with means which are adapted for moving in a circle around the axis of which the annular frame travels. Still another object is to provide means by which the figures, which are supported by the annular frame, may be moved relatively thereto.

Pertaining to Vehicles.

LOCKING DEVICE FOR DIFFERENTIAL GEARINGS.—Wm. Lee Burnam, Oskaloosa, Kansas. The device is applicable to an automobile or similar vehicle, and its object is to provide means for locking the differential gearing so as to neutralize the differential action,



LOCKING DEVICE FOR DIFFERENTIAL GEARING.

whenever it is desired to drive the axle sections in unison, thus preventing one axle section from spinning around loosely while the other section is retarded by meeting an obstruction. The lock consists of a set of pins which are fitted through two of the gears, connecting them together.

Note.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Notes and Queries.

Kindly write queries on separate sheets when writing about other matters, such as patents, subscriptions, books, etc. This will facilitate answering your questions. Be sure and give full name and address on every sheet.

Full hints to correspondents were printed at the head of this column in the issue of June 18th, 1910, or will be sent by mail on request.

(12267) C. E. N. asks: Will you please inform me if you know whether aluminium has ever been soldered or not? A. It was once impossible to solder aluminium, but in recent years several solders have been made which work satisfactorily, although the operation is still somewhat difficult. A number of solders are given in the SCIENTIFIC AMERICAN SUPPLEMENT Nos. 1610, 1622, and 1628, any of which will be sent on receipt of the price, 10 cents each. Solder for aluminum can be purchased. The price is something like a dollar a pound.

(12268) F. G. S. asks: Can you give me instructions for silvering and burnishing the mirrors for a reflector telescope? I have a 6-inch reflector telescope that I am of the opinion is not giving me as much power as it should. A. If the small mirror in your reflecting telescope were placed at the focus of the large mirror, you would not be able to see anything at the eyepiece. The small mirror must be placed far enough within the focus to have the image properly related to the eyepiece. This the maker of the instrument has done, if you are able to focus so that the objects are seen distinctly with the instrument. The magnifying power of the telescope is not affected by the position of the small mirror. It is determined by the eyepieces. You should have several eyepieces, so that the magnifying power may be adapted to the condition of the air. When the seeing is good, a higher power of eyepiece can be used than when the seeing is bad. For silvering mirrors, see our SUPPLEMENT No. 1671, price ten cents.

(12269) C. W. H. asks: 1. Upon what factors and in what proportion does the strength of an electric arc depend, measured by its difficulty of extinguishment? (a) For D. C. circuits, as voltage and amperes. (b) For A. C. circuits, as voltage and amperes, inductance, frequency, etc. A. An electric arc is maintained by the volts which are required to overcome the counter electromotive force of the hot carbon vapor for the positive carbon. The counter electromotive force varies with the current and other conditions. For an open arc of 10 amperes and 45 volts, or 450 watts, it is from 35 to 39½ volts as given by Crocker. We do not find any different figures given for alternating current arcs. Indeed, the question does not seem to be thoroughly investigated for all the varying conditions. 2. Why is mercury unsuitable for use in high-potential and high-current contactors, used under oil as a protection? A. We do not understand your second question. There is no apparatus known to us by the name "contactor," and hence we cannot explain the relation of mercury to its action. Mercury is used for some interrupters in induction coils. In this use it must be covered with some non-oxidizable substance to keep the air away from the surface of the mercury. The oxygen of the air would soon burn up the mercury and cover its surface with a layer of non-conducting oxide, thus stopping the action of the interrupter. The break is thus made very sudden and the coil gives a much better spark.

(12270) S. S. G. asks: I am using compressed air as a power for spraying an orchard. The compressor is run by water power, and some of my orchards are three-quarters of a mile from my power. Now I wish to know if it is practical to carry this air to the orchards in pipes, and what size and what kind of pipe would be required? I use two tanks of 100 gallons each; one contains the solution used for spraying, and air is compressed in the other to 200 pounds. When all the liquid is forced from the spray tank, we have about 90 pounds of air in the air tank. Is there an engine made for using compressed air? That is, can the power be transferred from the water wheel by means of air, say to a wood saw or to a feed cutter at the barn? How much power would be lost in the transfer? A. You can carry the air from your compressor three-quarters of a mile; the only question is the size of pipe and its cost. You have not stated how much water or air you desire to convey per minute. Assuming that ten gallons of water per minute, about three pailfuls, would be sufficient for the spray, this would require 1¼ cubic feet of compressed air to replace it in the spray tank. A 1¼-inch pipe without bends is likely to transmit this amount of air per minute with a loss of 12 to 15 pounds pressure in three-fourths mile; but we should suggest not less than 1½-inch pipe for practical use. Any common steam engine will work with compressed air as well as steam. If you use the air cold in the engine, you would probably lose less than one-half the power from the compressed air engine that you would expend in driving the compressor, provided that the connecting pipe is not less than sufficiently large to keep the loss of pressure down to say 5 per cent. We suppose a working pressure of 80 to 100 pounds. You would very much increase the efficiency by reheating the air close to the engine. This could be easily done by piping the air through a common upright steam boiler of small size, say 2 or 3 horse-power ordinary rating. A fire kept up in the boiler would heat a large quantity of compressed air passing through, and therefore greatly increase the volume, besides preventing the engine from freezing up as the air cools in expanding.

NEW BOOKS, ETC.

BRAUNBECK'S SPORT-LEXIKON. Automobilismus, Motorbootwesen, Luftschiffahrt. Herausgeber Gustav Braunbeck. Berlin: Gustav Braunbeck.

This is the most valuable, and probably the only, cyclopedia of its kind published in the world. It is divided into three sections. The first discusses the history and present status of the automobile; the second of the motor boat; and the third of aerial navigation. Each division begins with a historical summary, and the complete history of the automobile, the motor boat, or the flying machine, as the case may be, year by year. All the principal contests, and the results, are published. A list of automobile, motor boat, and aeronautic clubs, together with their members, is published, as well as statistical information and records which are valuable to those interested in modern sports of locomotion. The work is richly illustrated, and seems to us a thoroughly trustworthy and competent piece of compilation.

THE MEDITERRANEAN CRUISE. Compiled by Bruce Millard. New York: G. P. Putnam's Sons, 1910. 16mo.; 438 pp. Price, $2.25 net.

The present volume is a standard up-to-date compendium for Mediterranean travelers and contains pertinent information as to all points usually visited in a winter's cruise in Europe, Asia, and Africa. In fact, with its use the student can successfully travel without other descriptive aid. It is particularly valuable, as Baedeker's "Mittelmeer" has not been translated into English as yet. The book, which is light in weight, is well printed in good-size type, thus doing away with the objection to most guide books.

WHAT PICTURES TO SEE IN EUROPE IN ONE SUMMER. By Lorinda Munson Bryant. New York: John Lane Company, 1910. 16mo.; 183 pp. Price, $1.50 net; postage 15 cents additional.

The average European traveler is overwhelmed by the enormous collections which are to be found in even the cities of secondary importance. Thus, even in places like Nancy, Lyons, and Turin, we find impressive collections which require a long visit to thoroughly appreciate. The object of the present book is to eliminate the ninety-nine pictures and to concentrate the reader's attention on the one remaining. The idea is an excellent one and has been well carried out. There is very little to be said in criticism of the text, but some of the illustrations are ridiculously and unnecessarily small, such as the "Moretto" in the Academy at Venice, shown in Fig. 46.

HANDBUCH DER TELEPHONIE. Von Dr. Victor Wietlisbach. A. Hartleben's Verlag, 1910. 468 pp.; 445 ills. Price, $2.50.

In the last decade telephone engineering has made remarkable progress in Europe. The telephone itself is not changed, and the microphone transmitter has been radically modified only so far as it has been adapted to the needs of wireless telephony. The installation and operation of large exchanges, the wider introduction of the common battery system and automatic telephones, new methods of manufacturing and laying conductors, communication on international lines, and the economical utilization of telephone exchanges, have been manifest in Europe more than in this country. Furthermore, the theory and practice of self-induction on long lines has come very much to the fore recently with the invention and introduction of Pupin coils. In view of these advances in the art, it has been necessary carefully to revise "Handbuch ter Telephonie," which we reviewed when it first appeared several years ago. As the work now stands, it will be found an excellent handbook for the telephone engineer.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending

July 19, 1910,

AND EACH BEARING THAT DATE

[See note at end of list about copies of these patents.]

Adjustable reel, W. H. Earl 965,091
Advertising device, G. M. Hallam 964,967
Advertising device, H. R. Fisher 964,097
Aerial transportation, E. Lugo-Vina 964,989
Aeroplane, S. H. Gilson 964,771
Air compressor governor, G. O'Bryan 965,120
Air, means for increasing the energy of stored compressed, W. H. Sodeau 964,574
Albuminoid compound, indurated, B. B. Goldsmith 965,137
Aluminium and its alloys, manufacture of, H. F. D. Schwahn 964,566
Animal trap, J. R. Briggs 964,488
Animal trap, G. Portscue 964,808
Animal trap, W. Nepean-Hutchison 964,877
Automatic switch, C. R. Austin 964,836
Bakers' peels, handle for, S. E. Selleck 964,817
Balancing and steering planes, T. Windel 964,828
Baling press, W. R. Taylor 964,823
Bar. See Fire bar.
Barrel heater, W. D. Mount 964,673
Bath cabinet, A. M. Holaday 964,779
Bath tubs, bath or flesh brush attachment for, J. Booth 964,843
Battery. See Storage battery.
Battery and holder, G. L. Patterson 964,687
Battery indicator, storage, P. M. Marko 964,994
Bearing, H. B. Garman 964,859
Bedstead, E. J. Robison 964,812
Bed bottom, spring, E. V. Bair 964,480
Bed, wheeling, E. J. Leary 964,527
Beehive attachment, S. Blagg 964,744
Belt clamp, F. B. Whitmore 964,827
Binder lock, loose leaf, L. R. Dickerson 964,765
Binder, loose leaf, G. H. Robison 964,811
Blast furnace, J. Scott 964,885
Boat, A. Ege 964,627
Boat hull, J. S. Anderson 965,145
Boats, means for emptying submergence tanks in submergible, L. Y. Spear 964,943
Boats while in motion, device for automatically draining bilge water and other refuse from, J. A. Pyke 965,011
Boiler setting, G. B. McLeod 964,931
Boilers, pressure controlling device for, J. D. Walsh 965,053
Book mark and corner protector, combined, J. Bernhardt 964,895
Boot and shoe cleaner, G. E. Sipherd 965,029
Bottle, antirefillable, P. Fuzy 964,858
Bottle capping head, Marshall & Schlagel 964,926
Bottle capping machine, H. E. Marshall 964,925
Bottle holder for cork pullers and other machinery, E. Walker 964,588
Bottle washer mouthpiece, C. L. Volckening 965,051
Box lid clamp or holder, F. R. Covey 965,087
Box lid fastener, C. E. Hendrix 964,912
Box lid fastener, R. D. Smith 965,043
Bridle bit, L. N. Kelly 964,917
Brush, H. H. Stevens 964,707
Brush, fountain, A. D. Cardinet 965,075
Buckle, J. W. Johnson 964,973
Buffer, C. Buss 965,073
Bunsen burners, gas regulator for, F. S. Parker 964,804
Burner. See Furnace burner.
Button fastening, sliding, A. Heergeist 964,862
Button, separable, Mooney & Crane 964,928
Cable construction, H. W. Fisher 964,961
Candelabrum, G. J. Bernau 964,841
Candy wrapping machine, W. J. Pendleberry 964,689
Canister, J. Christensen 964,757
Caoutchouc from resinous products, separating, G. F. Fiamant 965,098
Car construction, metallic, H. H. Niemeyer et al 964,541
Car coupling, W. F. Richards 964,883
Car coupling, auxiliary, Ulsh & Goodman 964,713
Car coupling safety appliance, P. J. Harrigan 965,107
Car door, box, F. V. Carman 964,899
Car door operator, freight, J. A. Pickett 964,934
Car, dump, A. Campbell 964,749
Car fender, A. J. Thornley 964,887
Car lock for mine cages, automatic, Alpenfels & Williams 964,733
Car replacer, J. Clement 965,085
Car running gear, railway, A. R. Angus 964,479
Car, sleeping, H. H. Niemeyer et al 964,639, 964,540
Car, street, T. J. Mueller 964,929
Car vestibules, curtain releasing attachment for, O. Swanson 965,048
Car wheel, forged metal, E. E. Slick 965,040
Carbureter, R. E. Wynn 964,831
Card punching machine, Jacquard R. Zahn 965,056
Carpet stretcher, A. F. McBeth 965,118
Carrier. See Parcel carrier.
Casein compound, indurated, B. B. Goldsmith 964,964
Caskets and other articles, handle for, E. R. Sargent 964,562
Casting ingots, L. W. Southgate 964,576
Casting molten material, apparatus for, K. West 964,722
Castings, support for the internal molds of hollow, G. Weinbeer 964,949
Cattle releasing device, W. G. Grimsley 964,772
Celluloid or the like, manufacture of, T. Bolas 964,483
Cement brick machine, D. F. Shope 965,027
Cement producing apparatus, H. Passow 964,805
Change delivery device, C. J. Pollock 964,549
Charge box and course indicator, H. P. Guillo 964,773
Checkrein hook, harness, J. C. Averill 964,603
Cheese curds, obtaining a solid mass out of, L. Erasmus 964,504
Cheese cutter, L. M. Kuehn 965,114
Choke coil, H. J. Beck 965,062
Chopper, J. & W. Reagan 964,938
Christmas trees, adjustable light bracket for, G. J. Bernau 964,840
Cigar case, pocket, A. Sargent 964,699
Cigar cutter, C. J. Salviolo 964,561
Cigarettes, machine for applying spirally wound mouthpieces to wrappers or shells for, L. Lindeloff 964,663
Clip. See Hame clip.
Closet seat attachment, R. D. McDonald 964,533
Clothes drier, R. R. Pease 964,543
Clothes line reel, A. Mader 964,993
Cluster setting for jewelry, J. A. Doran 964,625
Cluster settings, making, J. A. Doran 964,624
Clutch, H. C. Marden 964,874
Clutch, automatic speed controlling, Bolinski & Schmidt 964,668
Clutch, friction, J. C. Garrett 964,639
Clutch, safety, T. Hagman 964,774
Coal drill support, R. Secrist 965,024
Coaster, P. H. Quackenbush 964,809
Coffee, extracting caffein from, H. Trillich 964,944
Coin controlled mechanism, H. A. Bullard 964,848
Coke retort oven, V. D. F. Fieschi 964,635
Compasses, H. C. Ford 964,962
Compression stop and waste, A. C. Schuermann, reissue 13,135
Compressor, J. T. Love 964,981
Compressor and vacuum pump valve, C. Walmwright 965,052
Computing machine, J. M. Daly 964,496
Concrete construction, sectional form for, G. H. Sherwood 965,026
Concrete construction, unit reinforcing frame for, E. L. Brown, Jr 965,070
Condensation meter, H. A. Austin 964,837
Contact former or line tapper, C. A. Beghtol 964,741
Container, B. O. Darrow 964,921
Controlling devices, interlocking safety mechanism for, F. H. Kittredge 964,654
Controlling mechanism, Chase & Gouverneur 965,081
Conveyer, chain, J. K. Boland 965,067
Cooler. See Water cooler.
Cooling tower, D. B. Morison 965,116
Cotton chopper, J. A. Grace 965,104
Counting machine, A. M. Hall 964,782
Coupling, H. T. Krakau 964,790
Cover for pads, books, etc., detachable, O. Loewenbach 964,668
Crate, egg, D. O. Smith 965,042
Cream separator, W. C. Hartmann 964,043
Cream separator, centrifugal, E. A. Forsburg 964,505
Cultivator, D. F. Deppe 964,500
Cultivator, F. E. Davis 964,763
Culvert construction, Traub & Heifrecht 964,585
Curd-breaking apparatus, Poulin & Baril 964,935
Current motor, alternating, P. Utne 964,714
Current regulator, V. G. Apple 965,059
Curtain rod, C. W. Kirsch 964,653
Cuspidor, R. A. McCarty 964,930
Cuspidor, Horvath & Kotrucz 965,109
Cutter. See Cheese cutter.
Cycles, combination rear seat and carrier for motor, F. P. Fentress 965,093
Damper regulating mechanism, B. C. Wickes 964,892
Deflocculating insoluble bodies, E. G. Acheson 964,478
Delinting machine, D. Grant 964,909
Diamonds, etc., for industrial uses, apparatus for setting, R. Krause 964,792
Dipper and funnel, combination, H. Gerling 964,908
Disinfecting apparatus, W. H. Rose 964,559
Disk drill, C. W. Dickinson 964,708
Display box, folding, Schandein & Lind 965,019
Display device, R. W. Ralph 964,553
Display holder, F. R. Warren 964,826
Display rack, R. C. O'Neil 964,683
Display rack, door, H. E. Forgy 965,099
Distributer, J. B. Hutchinson 964,971
Door operating and locking device, prison, B. F. Kloha 964,525
Door operating mechanism, dump, F. Swaberg 965,023
Doors and the like structure, metallic, C. E. Nellis 964,676
Draft evener, J. E. Caywood 965,080
Draft rigging, J. Timms 965,130
Drying and condensing apparatus, R. W. Amos 965,058
Dump, crossover, O. V. Grace 964,953
Dust and other materials from dust laden air and a dust collector for carrying out said process, separating, C. F. Verrell 964,717
Dust separating or vacuum cleaning apparatus, L. W. Serrell 964,940
Dyes, azo, Kahn & Oesenbeck 964,786
Dye, bluish-red disazo, A. L. Laska 964,918
Dye, brown mordant azo, A. L. Laska 964,919
Dye, disazo, A. L. Laska 964,920
Dyeing and product thereof, R. E. Schmidt 964,816
Electric and gas fixture bracket, combination, J. D. Coder 964,493
Electric controllers, loose motion device for, R. V. Hill 964,819
Electric current interrupter, P. B. Cumings 964,760
Electric heater, A. S. Cubitt 964,759
Electric machine, dynamo, J. P. Feeney 964,630, 964,770
Electric machine dynamo, B. A. Behrend 964,742
Electric service wires, insulated distributer for, J. B. Ashley 964,737
Electric switch, W. S. McLewee 964,536
Electric switch, C. F. Lewis 964,798
Electric wire coupling, A. H. Hesterhagen 974,979
Electrical contact, G. W. Goodridge 965,103
Electrical distribution system, J. L. Woodbridge 964,830
Electrodes, guide and holder for arc lamp, G. M. Little 964,667
Electromagnetically operated switch, J. F. Tritle 964,711
Elevator. See Rope drive elevator.
Engine, S. D. Ferry 965,094
Engine, F. A. Sharpneck 964,702
Engine starting mechanism, gas, A. B. Eyre 964,649
Engine vaporizer, hydrocarbon, E. P. Lamb 964,657
Engines, cooling system for internal-combustion, T. Odee 964,542
Eraser, typewriter, J. J. Hyer 965,144
Excavating apparatus, E. A. Newman 964,990
Extractor. See Rock drill extractor.
Eyeglass lens mount, L. F. Adt 964,732
Eyeglasses, G. Bausch 964,130
Eyeleting machine, J. A. Dunphy 964,626
Fabric borders, machine for making, H. S. North 965,001
Fabric clasp, F. W. Harkins 965,143
Fat, manufacturing an improved edible, D. Muller 964,674
Faucet, A. A. Bowser 964,486, 964,487
Faucet, H. G. Cordley 964,615
Faucet coupling, C. F. Ackerman 964,731
Feed water controller, Reynolds & Page 964,690
Feeder, animal, G. G. Fryer 964,906
Feeder, boller, A. Junger 964,916
Feeding mechanism, F. Wegner 964,721
Fence, Bodl, W. Kemper 965,111
Ferroconcrete construction, skeleton interlocking reinforce-band for, J. H. MacDonald 964,992
Fertilizer distributer, G. Karnatz 964,787
Filling loose sheets, M. P. Ismay 964,972
Filter, J. Roche 964,686
Filter basin, J. G. Richert 964,694
Filter press, H. H. Whiting 964,725
Filter pulp, R. Polk 965,010
Firearm sight, A. Swasey 964,709
Fire bar, lifting, J. & W. Reagan 964,937
Fire box door closer, R. A. Philbrick 965,009
Fire lighters, device for the manufacture of bundled, W. B. Pinching 964,548
Fish, bait-, cutting machine, W. B. Phinney 964,881
Flagpoles, safety appliance for sealing, C. E. Kirby 964,975
Float, C. H. Zwermann 964,729
Flood gate, adjustable, W. Kemper 965,112
Fire thimble, R. Hall 964,642
Fluid brake, F. Bomighaus 964,485
Fluid pressure motor, R. C. Jenner 964,806
Fluid pressure regulator, W. E. Beech 965,064
Fluids, interconversion of kinetic and potential energy of, S. Z. de Ferranti 964,683
Flushing attachment, drain pipe, W. A. Coles 964,954
Flushometer, F. M. Ashley 964,735, 964,736
Flying machine, H. O. Blane 964,957
Flying machine, H. Schoubee 965,021
Folding box and crate, C. Dickie 965,089
Foot, punch, and similar playing ball, Turner & Buxton 964,888
Forging metal, method of and apparatus for, E. E. Slick 965,036
France. See Window frame.
Frame lock, automatic, C. Merritt 964,997
Fruit picker, M. J. Keating 964,788
Fuel, J. Jowett 964,523
Fuel briquets, making, E. Bonstein 965,069
Furnace. See Blast furnace.
Furnace, C. S. Drummond 964,502
Furnace, H. Kurtenacker 964,656
Furnace burner, M. Fall 964,902
Furnace for reducing metallic oxids, C. M. Johnson 964,871
Fuse, F. H. Weston, Jr 964,592
Gage. See Liquid gage.
Game, J. Y. Henry 964,644
Game apparatus, F. C. Wegener 964,718
Garbage crematory, O. M. Shannon 964,568
Garment clasp, W. P. Hannaford 964,968
Gas, apparatus for manufacturing heating and illuminating, Wynne & Wagley 964,832
Gas burners, regulating device for the feed conduits of, E. Stell 965,045
Gas engine, reversing, D. Schlegel 964,584
Gas producer, R. P. Conkling 965,086
Gas purifier, C. Wegescheidt 964,719

Legal Notices

PATENTS

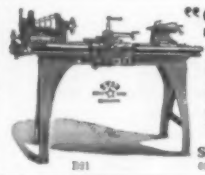
INVENTORS are invited to communicate with **Munn & Co., 361 Broadway, New York,** or **625 F Street, Washington, D. C.,** in regard to securing valid patent protection for their **inventions. Trade-Marks** and **Copyrights** registered. **Design Patents** and **Foreign Patents** secured.

A Free Opinion as to the probable patentability of an invention will be readily given to any inventor furnishing us with a model or sketch and a brief description of the device in question. All communications are strictly confidential. Our **Hand-Book** on Patents will be sent free on request.

Ours is the **Oldest** agency for securing patents; it was established over sixty-five years ago.

MUNN & CO., 361 Broadway, New York
Branch Office, 625 F St., Washington, D. C.

Gases, extraction of tar and tar constituents from, W. Feld 965,147
Gases, treating combustible, H. L. Doherty 964,901
Gasket, W. A. Schultheis 965,022
Gate. See Flood gate.
Gate, W. J. Perritt 964,545
Gate, J. H. Pearson 964,807
Gearing, G. Cartwright 964,490
Gin saw cleaner, J. C. Shropshire 964,818
Glove, C. E. & R. C. Chaddock 964,008
Glue, apparatus for the preparation of colorless, J. Lehmann 964,980
Grader, L. N. Morscher 965,140
Grain drill, C. W. Dickinson 964,767
Grain drills, grass seeding attachment for, W. A. Van Brunt 964,715
Grinding device for blades, Wolf & Bannister 964,598
Grinding and sifting apparatus, J. S. Fasting 964,629
Grinding tool, E. J. Fink 964,636
Gripper mechanism, C. Van Middlesworth 965,128
Gun, air, D. J. Rieger 964,810
Gun carriages, saddle for machine, W. Sonnberg 964,821
Gun protective shield, J. Singer 964,570
Gun, take down, T. C. Johnson 964,974
Gun training and elevating mechanism, Meigs & Hammar 964,927
Hair comb, J. Cranmer 964,496
Halter, F. H. Varney 964,947
Hame clip, H. W. Hagman 965,106
Harness, J. A. Cummings 964,618
Harvester, cotton, G. C. Elliott 964,958
Harvester cutter, corn, F. A. R. Fiebach et al. 965,134
Harvesting device, broom corn, W. W. Jordan 964,522
Hat fastening, Holland & Curtis 964,780
Headlight, F. P. Bennack 964,481
Heating system, air, S. S. Laughlin 964,921
Hill climbing wheel, D. C. Slaght 965,030
Hoof pad, B. F. Porter 964,551
Hoof pad, adjustable, P. F. Burke 964,747
Horseshoe, detachable, A. Lenta 964,797
Horseshoe toe calk bar, A. T. McCreary 965,119
Hose coupling, J. H. Stephens 964,578, 964,579
Hot water apparatus, D. C. Seymour 964,941
Hydrant casing, H. P. James 964,784
Hydrocarbon for combustion, preparing liquid, E. J. Wiggins 964,893
Hydrometer, J. Ely 964,628
Ice cream cone oven, L. H. Lanier 964,873
Ice machine, H. D. Fownall 964,936
Identification device, F. A. Delabarre 964,499
Incandescent mantles, manufacture of, A. G. Adamson 965,057
Incubator, A. Gerard 964,509
Incubator heating device, J. L. Nix 964,680
Inkstand, C. L. Smith 964,572
Instrument, combination, H. M. Johnson 964,785
Insulator, J. B. Tufts, Jr. 964,586
Insulator, Smithson & Osborne 965,123
Internal combustion engine, H. C. Gibson 965,135
Jack screw, ball bearing, O. E. Tidd 964,824
Jar holding device, fruit, E. Lee 964,978
Kettle, P. Rotondo 964,815
Key, W. C. Filson 965,095
Knife and bottle opener, combined, I. Rose 964,358
Knockdown table, F. Matthes 964,906
Ladder, folding step, F. B. Van Cleave 964,587
Lamp, arc, G. M. Little 964,664
Lamp, arc, Fleming & Halvorson, Jr. 964,691
Lamp burner, B. F. Fowler 964,904
Lamp casing, arc, G. M. Little 964,695
Lamp, incandescent electric, E. W. Rice, Jr. 964,692
Lamp lighting and extinguishing means, gas, A. Giorgi 965,102
Lamp starting device, arc, G. M. Little 965,139
Lamps, starting device for electric, G. M. Little 964,665
Latch, J. E. Terrell 965,125
Latch, barn door, A. Neuenschwander 964,876
Lathe attachment, jeweler's, Greenwald & Harrison 965,105
Lawn trimmer, F. C. Reynolds 964,882
Lever mechanism, J. F. Chilcote 965,082
Lift cages, safety catch for suspended, F. Weidig 964,890
Lifting jack, R. M. Fraley 964,905
Lifting jack and wire stretcher, combination, Wiltman & Clement 964,594
Liquid gage, G. Everson 964,960
Liquids, inlet controller for, F. B. Leopold. 964,528
Lock, J. W. Freeman 964,507
Lock, H. H. & W. W. Lyon 964,990
Lock motor cam, door, R. E. Westlin 964,991
Locks, keeper plate for door, S. Kozlowski. 964,789
Locomotive pedestal grinder, W. Salmon 964,884
Logging machine, J. R. McGiffert 964,534, 964,535
Looms, automatic weft replenishing, C. F. Roper 964,557
Looms, automatic weft replenishing, H. S. Stimpson 964,580
Loom, automatic weft replenishing, M. L. Stone 964,582, 964,872
Loom shuttle, J. Johnson 964,970
Looms, pick matcher for automatic weft replenishing, P. Day 964,497
Looms, pick matcher for automatic weft replenishing, A. E. Rhoades 964,555
Looms, pick matching mechanism for automatic weft replenishing, C. H. Draper. 964,501, 964,670
Lumber sorter, M. Moncreiffe 964,939
Machine support, A. B. Reid 964,811
Machine tools, spindle locking mechanism for, A. L. de Leeuw 964,704
Mail box, Schneider & Gossom 965,020
Mail crane attachment, J. H. Bos 964,746
Manure spreader, J. D. Echols 964,853
Match box holder, C. R. Radford 965,012
Memorandum case and register, J. N. Stacy 965,141
Metal to a molten state suitable for casting, W. S. Brian 964,896
Metal wheels, forming dished, E. E. Blick. 965,039, 965,041
Metallic oxids, reducing, C. M. Johnson 964,998
Measuring instrument, hot wire electrical, J. T. Irwin 964,521
Meter. See Condensation meter.
Meter, R. L. Rickman 964,695
Meter lock, I. W. Norcross 964,681
Meter prover, R. L. Degendorf 964,956
Milk preserving apparatus, L. D. Lewis 964,983
Mines, emergency escapeway for, A. H. Sasse 964,563
Miter cutting machine, W. R. Fox 964,506
Mixing and crushing machine charging device, G. Handle 964,512
Molding apparatus, A. A. Pauly 965,005, 965,006
Motion mechanism, intermittent, C. R. Uebelmesser 964,712
Motor control, E. R. Carichoff 964,751
Motor control system, electric, R. G. Lamme 964,794
Motors, means for operating and controlling single phase alternating current, B. G. Lamme 964,659
Motors, operating and controlling single phase alternating current, B. G. Lamme 964,793
Motors, operating electric, B. G. Lamme .. 964,658
Movement cure appliance, T. Budinger 964,898
Mower, lawn, T. Crawley 964,617
Mower, lawn, C. W. Felker 964,631
Mower, lawn, G. Slatter 965,031
Muffler, smokeless, B. Dionby 965,090
Muscles of the body and arms, device for developing and strengthening the, R. Blakoe 964,745
Music strips, perforating, H. P. Ball 964,951
Musical instrument, electrical, I. Engstrom 964,503
Musical instrument, stringed, G. D. Laurian 964,690
Napkin holder, W. A. Balke 964,739
Necktie, C. W. T. Davies 964,496
Necktie, A. J. Charon 964,755
Notching and slitting strips, machine for, Coe & Werden 964,614
Note sheets, expression marking for, P. K. Van Vorst 964,716
Nozzle, C. Vacher 964,945, 964,946
Nozzle, spraying, H. Maasberg 964,991
Numbering machine, W. H. Smith 965,044
Nut, divided, G. Cartwright 964,752
Nut lock, O. C. Boedler 964,813
Nut lock, C. B. Burrows 964,840
Nozzle, suction, J. C. Linden 964,800
Oil can, non-explosive, C. Rosenzweig 965,015
Oil feeding mechanism, G. Fornaca 964,637
Oils, making fatty compounds for use as turkey red, A. Schmitz 964,565
Ore concentrator, hydraulic, J. G. Kirksey. 964,652
Ore separating machine, A. G. & E. G. Seberg 964,567



"Star" Large line of Attachments
For Foot or Power **Lathes**
Suitable for fine accurate work in the repair shop, garage, tool room and machine shop.
Send for Catalogue B
SENECA FALLS MFG. CO.
695 Water St., Seneca Falls, N. Y.

Engine and Foot Lathes
MACHINE SHOP OUTFITS, TOOLS AND SUPPLIES. BEST MATERIALS. BEST WORKMANSHIP. CATALOGUE FREE
SEBASTIAN LATHE CO., 120 Culvert St. Cincinnati, O.

JUST PUBLISHED
VEHICLES OF THE AIR
By V. LOUGHEED
A Popular Exposition of Modern Aeronautics with Working Drawings. The most complete book published on aerial navigation. 479 pages, 6½ x 9¼ inches, 270 illustrations, including working drawings of machines and parts. Price $2.75 postpaid. Send for a descriptive circular.
MUNN & COMPANY, Inc., 361 Broadway, New York City

THE "LAKE OF BAYS" COUNTRY
A handsome brochure, artistically illustrated, issued by the Grand Trunk Railway System, telling of the beauties of the Lake of Bays district, in the "Highlands of Ontario." The concise description embodies the story of a charming resort. A new feature of this district is the new hotel—"the Wawa"—at Norway Point.
A copy can be obtained free on application to F. P. Dwyer, 290 Broadway, New York.

THE "BARNES"
Positive Feed **Upright Drills**
10 to 50-inch Swing
Send for Drill Catalogue.
W. F. & JNO. BARNES CO.
(*Established 1872*)
1999 Ruby St., Rockford, Ill.

HOEFT & COMPANY
Die Makers, Model Makers, Machinery Builders, Punch Presses
Light and Heavy Stampings. 141 Michigan St., Chicago, Ill., U.S.A.

The Reason Why the **KREMENTZ**
Rolled Plate Collar Buttons Outwear all Others

This Diagram Illustrates Quantity of Gold in **Imitation Buttons**
This Illustrates Quantity of Gold in the **Krementz Button**
At all dealers. Gold and rolled plate. Insist on the Krementz. If damaged in any way a new one free. *Story of Collar Button* showing shapes and sizes free. If dealer will not supply, we will.
Krements & Co., 77 Chestnut St., Newark, N. J.

POLAR WATER STILLS
ALL CAPACITIES
For Colleges, Clubs, Hospitals, Hotels, Laboratories, factories, bottlers or the home; wherever chemically-pure and palatable water is essential or desired.
Automatic, economical and dependable apparatus.
Send for Bulletin
POLAR ICE MACHINE COMPANY
83 Jackson Boulevard, Chicago

Instructive Scientific Papers
ON TIMELY TOPICS
Price 10 Cents each by mail

ARTIFICIAL STONE. By L. P. Ford. A paper of immense practical value to the architect and builder. SCIENTIFIC AMERICAN SUPPLEMENT 1500.
THE SHRINKAGE AND WARPING OF TIMBER. By Harold Busbridge. An excellent presentation of modern views; fully illustrated. SCIENTIFIC AMERICAN SUPPLEMENT 1500.
CONSTRUCTION OF AN INDICATING OR RECORDING TIN PLATE ANEROID BAROMETER. By N. Monroe Hopkins. Fully illustrated. SCIENTIFIC AMERICAN SUPPLEMENT 1500.
DIRECT-VISION SPECTROSCOPES. By T. H. Blakesley, M.A. An admirably written, instructive and copiously illustrated article. SCIENTIFIC AMERICAN SUPPLEMENT No. 1493.
HOME MADE DYNAMOS. SCIENTIFIC AMERICAN SUPPLEMENTS 161 and 600 contain excellent articles with full drawings.
PLATING DYNAMOS. SCIENTIFIC AMERICAN SUPPLEMENTS 720 and 793 describe their construction so clearly that any amateur can make them.
DYNAMO AND MOTOR COMBINED. Fully described and illustrated in SCIENTIFIC AMERICAN SUPPLEMENTS 844 and 865. The machines can be run either as dynamos or motors.
ELECTRICAL MOTORS. Their Construction at Home. SCIENTIFIC AMERICAN SUPPLEMENTS 759, 761, 767, 641.

Price 10 Cents each, by mail
Order through your newsdealer or from
MUNN & COMPANY, Inc.
361 Broadway New York

PICTURE TELEGRAPHY.
(*Continued from page 80.*)

and the bottom plate. As soon, however, as any pressure is brought to bear upon the center, the flexibility of the membrane between the three summits of the triangle will enable it to give way without breaking.

The contacts between the grains and the membrane on the one hand, and the grains and the bottom plate on the other, are the more perfect, as the pressure exerted on the membrane is more considerable, and their resistance, as well as the total resistance of the microphone, will be reduced in proportion.

Experience has shown this apparatus to resume with absolute safety its initial resistance as soon as the pressure is relieved; a given pressure always corresponds to a given variation in the resistance of the microphone. This can be ascertained by means of a micrometrical outfit similar to a spherometer, provided the external conditions be left unaltered.

The only difficulty to be overcome was that the microphone being in itself of very low resistance, any variations in its resistance are quite negligible as compared with the absolute resistance of the circuit. In telephone work this difficulty is avoided by using an induction coil, but such an apparatus could not be used in connection with tele-photography, lest the dark and light portions of the picture be mixed up.

Belin therefore devised the following arrangement:

The microphone was substituted for the resistance to be measured, in a Wheatstone bridge formed by the transmission line, the galvanometer being replaced by the receiving post. The three remaining branches of the system can be chosen at will, and by a proper regulation, allow the intensity and sensitiveness of the arrangement to be readily controlled. A very important advantage of this scheme is the fact that the receiving and transmitting apparatus are maintained in absolute agreement independently of the length of the intervening line.

On account of the extraordinary sensitiveness of the microphone, it is not only possible but it is indispensable to resort to extremely slight differences in relief. In fact, the best results are obtained with ordinary photographic carbon paper, the relief of which is perceptible neither to the eye nor to the touch.

The fluctuations in current intensity produced by variations in the microphone resistance (which in turn correspond to the different shades of the original photographs) according to the above, are transmitted to the receiving station situated at any distance, in order there to be reconverted into fluctuations of light.

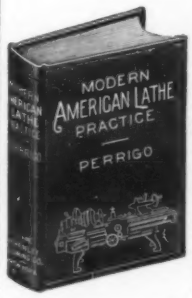
The receiving station is identical in principle with the arrangement used in the original apparatus, a Blondel oscillograph being used to produce this conversion.

The oscillograph, as is well known, mainly consists of a strong electro-magnet including between its pole pieces two extremely thin wires. These wires are connected together at one end, and constitute a loop closing the circuit. In their center is arranged a small mirror of about one square millimeter (0.00155 square inch), which by the torsion of the wires, as produced by the passage of the current, is deflected more or less, according to the actual current intensity. On this mirror falls the converging beam from an intense lamp, e. g., a Nernst lamp, the reflected rays being projected on the surface of the film on which the reproduction has to appear. By inserting an aplanatic lens, these rays are always concentrated in a given point, and by arranging a scale of light filters of regularly increasing transparency, the reflected rays are varied in intensity in proportion to the actual current intensity (and accordingly to the shades of the original picture), so that the rendering on the film gives a faithful reproduction of the last. Any diffraction is avoided by arranging an extremely

(*Concluded on page 93.*)

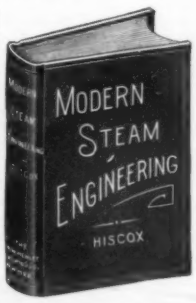
VALUABLE BOOKS

MODERN AMERICAN LATHE PRACTICE
By OSCAR E. PERRIGO, M.E.
Price $2.50



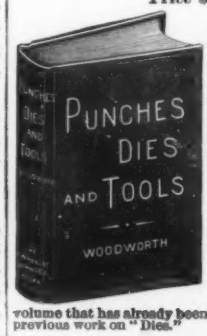
A complete book of 400 pages on The Modern American Lathe. Its development from the earliest times up to the present day; its modern form as constructed by up-to-date builders; its general and special classes of work, the quantity of its output; and its marvelous accuracy. Written by a man who knows not only how work ought to be done, but who also knows how to do it, and how to convey this knowledge to others. It is strictly up-to-date in its descriptions and illustrations which represent the very latest practice in lathe and boring mill operations as well as the construction of and latest developments in the manufacture of these important classes of machine tools. A large amount of space is devoted to the turret lathe, its modifications and importance as a manufacturing tool. Multiple spindle and automatic chucking lathes are fully considered, as are also special high power lathes for the use of high speed tool steel, and electrically driven lathes. In the treatment of the subject 335 illustrations and examples from the best practice have been made use of, as by illustration alone can many of the important details and methods be clearly presented.

Modern Steam Engineering in Theory and Practice
By GARDNER D. HISCOX, M.E.
Price $3.00



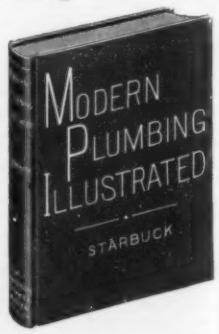
This is a complete and practical work of 487 pages, dealing with the care and management of Boilers, Engines, Pumps, Superheated Steam, Refrigerating Machinery, Dynamos, Motors, Elevators, Air Compressors, and all other branches with which the modern Engineer must be familiar. It fully describes and illustrates the properties and use of Steam for the generation of power in the various types of engines in use, Slide Valve, High-Speed Corliss, Compound, Multi-expansion engines and their valve gear, the De Laval, Parsons, Curtis and other Turbines are included and fully described and illustrated. Forty two tables of the properties and application of steam in its various uses are included, which in themselves form a most valuable and instructive section of the work.
Nearly Two Hundred Questions with their Answers on Steam and Electrical Engineering likely to be asked by the Examining Board are included. These if studied by you will help you to procure a license. This book is thoroughly reliable and practical, and not only a guide but a teacher. As a text book it is the latest and best authority on the subject. It is fully illustrated with detail engravings, not to be found elsewhere.

Punches, Dies and Tools for Manufacturing in Presses
By JOSEPH V. WOODWORTH
Price $4.00



A practical work of 500 pages fully illustrated by nearly 700 engravings, being an encyclopedia of Die Making, Punch Making, Die Sinking, Sheet Metal Working, and Making of Special Tools, Sub-Presses, Devices and Mechanical Combinations for Punching, Cutting, Bending, Forming, Piercing, Drawing, Compressing and Assembling Sheet Metal Parts and also Articles of other Materials in Machine Tools. Two Hundred and Ten Processes are clearly described and fully illustrated. This work is a companion volume to the author's elementary work entitled "Dies, Their Construction and Use." Nothing appears in this volume that has already been published in the author's previous work on "Dies."

Modern Plumbing Illustrated
By R. M. STARBUCK
Price $4.00



A comprehensive and up-to-date work illustrating and describing the Drainage and Ventilation of dwellings, apartments, and public buildings, etc. The very latest and most approved methods in all branches of sanitary installation are given. Adopted by the United States Government in its sanitary work in Cuba, Porto Rico, and the Philippines, and by the principal boards of health of the United States and Canada. 300 pages. 55 full page illustrations.

☞ *A special circular describing these books sent on request.*
☞ *Any of these books sent prepaid on receipt of price.*

MUNN & COMPANY, Inc.
Publishers 361 Broadway, New York

(*Concluded from page 92.*)

thin opening one-sixth millimeter in diameter (0.0236 inch) above the sensitive surface so as to be in immediate contact with the latter.

As the original photograph can be made ready within fifteen to twenty minutes, and as the time of transmission does not exceed three to four minutes (which is very much shorter than in connection with any other process), it may be said that the Belin process allows any event to be reproduced by a faithful photographic picture, twenty to twenty-five minutes after its occurrence, at a distance of up to 1,500 miles.

The same process obviously, is excellently adapted for the transmission of handwriting and drawings. The reproduction of a photograph as telegraphed by means of this apparatus frequently possesses even more strikingly artistic effects than the original itself, as the minute traces of indistinctness still left, will impart to the picture the very appearance of a painting.

A Forecast of the 1911 Automobile.

(*Continued from page 81.*)

seems to have been overlooked by some of the makers, for in many cases the general lines have been copied, but the vital features omitted. One benefit that has sprung from it, however, is the introduction of doors at the front entrance, a feature that will be appreciated by all who use their cars in cold weather.

It is well recognized that the front seats of a touring car are far easier riding than the tonneau seats, which is undoubtedly the chief reason for the adoption of the surrey or "toy tonneau" type of body. In the best designs, the tonneau seats are well forward of the rear axle, and to allow for this the dash is close to the rear cylinder of the engine. Hence the front toe boards are sharply sloped, with the disadvantage of rendering certain parts of the engine somewhat inaccessible.

In general, wheel bases will be unchanged, and this applies also to the arrangement of the springs. The weight of an automobile makes the problem of its suspension a difficult one, and is responsible for the absence of the easy riding qualities of a horse-drawn vehicle. It is inevitable that improvements in this part of the construction will be made, but there are few indications of serious work being done in this direction.

In regard to the engine, the four-cylinder type retains the foremost position, although a number of makers have abandoned it, and are producing six-cylinder cars exclusively. These are of sizes that develop 30 horse-power and over, but inasmuch as the European designers are turning out six-cylinder cars as small as 12 horse-power, it is not surprising to learn that some of the American makers have similar designs in view.

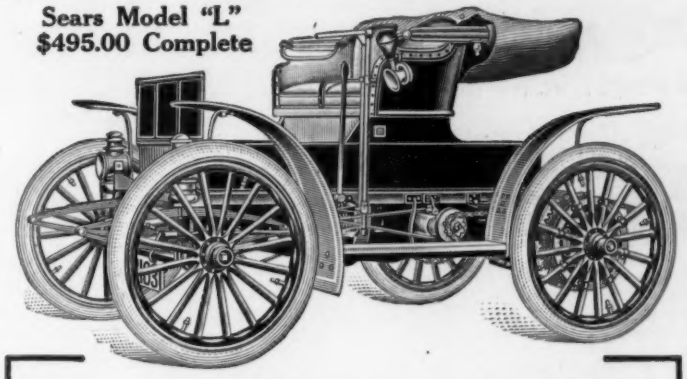
The horizontal double-opposed engine, which is a distinctly American type, is losing in popularity, and a number of makers whose reputations have been built on it have announced four-cylinder models for 1911. As an illustration of the diversity of design a car may be mentioned that will shortly make its appearance, of which the engine is of the eight-cylinder V-type, and also of a car equipped with a single cylinder engine with a stroke that is twice the bore; the engine is reported to develop 40 horse-power at 2,400 revolutions per minute. Cars having engines of this character were the racing sensation of Europe in 1909, and developed extraordinary speed.

The "block" type of engine, in which three or four cylinders are cast and handled as a unit, is decidedly in favor, for the construction results in economy of weight, size and cost. In four-cylinder engines of this type the crank shaft is supported on but two bearings, and because of the strains to which this subjects the parts, a high grade of material and workmanship is necessary for success.

The year 1910 saw the abandoning of the mechanical lubricator in favor of a

(*Continued on page 94.*)

Sears Model "L"
$495.00 Complete



Sears Automobiles

Doctors, Farmers, Ranchmen, Bankers, Salesmen, Solicitors, Agents, Mail Carriers and Business Men in every state of the Union are concentrating their attention on the SEARS.

FROM starting crank to tail lamp the Sears is the economic-reliability automobile. The Sears is built in our own Chicago factory in six distinct models, and the broad, absolute guarantee of Sears, Roebuck and Co. affords the individual buyer his positive individual protection. Inside prices ranging from $370.00 up show but one phase of Sears economy—low cost of up-keep is another.

The new Sears Automobile Catalog fully illustrated is just fresh from the press—it tells the whole Sears Story in an interesting way and is not weighted down with questionable scientific and mechanical terms. Our Booklet "What Sears Owners Say" contains many real human documents—letters right from the people who drive and enjoy the Sears. We want you to have one of these catalogs whether you intend buying an automobile or not—we want you to learn for your personal information of the most remarkable automobile proposition that ever appeared in print.

Write today for the Booklet and Automobile Catalog No. 70S44

Sears, Roebuck & Co. *Chicago*

MUSKOKA THE BEAUTIFUL

Do you know the place? If not, your pleasure has suffered. Ask for that handsome Muskoka Folder issued by the Grand Trunk Railway System. It contains a large map, lots of views, and a fund of facts. Less than a day's journey from principal American cities. For all particulars apply to F. P. Dwyer, 290 Broadway, New York.

How to Construct An Independent Interrupter

In SCIENTIFIC AMERICAN SUPPLEMENT, **1615**, A. Frederick Collins describes fully and clearly with the help of good drawings how an independent multiple interrupter may be constructed for a large induction coil.

This article should be read in connection with Mr. Collins' article in SCIENTIFIC AMERICAN SUPPLEMENT, **1605**, **"How to Construct a 100-Mile Wireless Telegraph Outfit."**

Each Supplement costs 10 cents; 20 cents for the two. Order from your newsdealer or from

MUNN & CO., Inc., 361 Broadway, New York

Delight the Young and Old

Earn everybody's praise and good will, and they will PAY YOU WELL FOR DOING IT if you provide them with the amusement that can be afforded at parks, fairs, exhibition grounds, and other public celebrations by operating our fascinating and money-drawing.

AMUSEMENT OUTFITS

including carrouselles, steam and electric riding galleries, merry-go-rounds, park swings, ocean waves, razzle-dazzles etc etc

HERSCHELL-SPILLMAN COMPANY

67 Sweeney Street, North Tonawanda, New York

"RANGER" BICYCLES

Have *imported roller chains, sprockets* and *pedals; New Departure Coaster Brakes* and *Hubs; Puncture Proof Tires; highest grade equipment* and many advanced features possessed by no other wheels. *Guaranteed 5 years.*

FACTORY PRICES direct to you are less than others ask for cheap wheels. Other reliable models from $12 up. A few good second-hand machines $5 to $8.

10 DAYS' FREE TRIAL We ship on approval, *freight prepaid*, anywhere in U. S. *without a cent in advance.* DO NOT BUY a bicycle or a pair of tires from *anyone* at *any price* until you get our big new catalog and *special prices* and *a marvelous new offer.* A postal brings everything. *Write it now.*

TIRES Coaster Brake Rear Wheels, lamps, parts, and sundries *half usual prices.*

Rider Agents everywhere are coining money selling our bicycles, tires and sundries. **Write today.**

MEAD CYCLE CO., Dept. S.175 CHICAGO

GRAY MOTORS
6 HORSE POWER COMPLETE
1,253 Cylinders, 3 to 30 H.P.
$94
Absolutely Guaranteed by a RESPONSIBLE concern.
Write for complete catalog today—tells all about how these high grade motors are built in the largest plant in the world devoted exclusively to the manufacture of 2-cycle motors.
GRAY MOTOR CO., 11 LEIB ST., DETROIT, MICH.

Palmer Motors and Launches

Two and Four Cycle. One, Two and Four Cylinder. Stationary and Marine. One to Twenty H. P. Catalogue FREE.

PALMER BROS., Cos Cob, Conn.

New York: 31 E. 21st St. Philadelphia: The Bourse. Boston: 88 Union St. Providence, R. I.: 242 Eddy St.

Portland, Me.: Portland Pier. Seattle, Wash.: 800 First Ave. So. Vancouver, B. C.: 1600 Powell St.

The Design and Construction of Induction Coils

By A. FREDERICK COLLINS

Size 6¼ x 9¼ inches. 295 pages. 159 illustrations. Price $3.00, postpaid.

THIS work gives in minute details full practical directions for making eight different sizes of coils, varying from a small one giving a one-half-inch spark to a large one giving twelve-inch sparks. The dimensions of each and every part down to the smallest screw are given, and the descriptions are written in language easily comprehended.

Much of the matter in this book has never before been published, as, for instance, the vacuum drying and impregnating processes, the making of adjustable mica condensers, the construction of interlocking reversing switches, the set of complete wiring diagrams, the cost and purchase of materials, etc. It also contains a large number or valuable tables, many of which have never before been published. It is the most complete and authorative work as yet published on this subject. The illustrations have all been made from original drawings which were made especially for this work. A large circular, containing a full table of contents and samples of the illustrations will be mailed on request.

MUNN & CO., Inc., Publishers
361 Broadway, New York

Ores, treatment of, C. M. Johnson	964,870
Organs and other musical instruments, suction wind chest for self playing, W. A. Brauer	964,607
Oven, knockdown portable, M. A. Flannery	964,855
Oven, portable knockdown, W. E. Huenefeld	964,914
Overshoe, L. B. Trafton	965,127
Oxygen generator, M. S. Clawson	964,492
Packing and display case, combination, E. B. Rogers	964,556
Paper box machine, Hincher & Morrison	964,645
Paper making machine save-all, N. Bryant	964,897
Parcel carrier, automatic electric, C. H. Bigby	965,066
Pasteurizing apparatus, J. W. Heiser	964,777
Pen, self filling fountain, H. Lewinson	964,782
Penholder, W. King	964,650
Penholder, ejecting, J. N. Smith	964,573
Perch for poultry, J. E. Patterson	964,806
Percolator, J. R. Holley	964,518
Phonograph record cabinet, N. Jensen	964,867
Photographic printing device, S. D. Butcher	964,748
Pianissimo device, E. Peterson	964,880
Piano, mechanically operated, F. V. Crofut	964,955
Pick, J. Kukuruda	964,976
Pipe coupling, J. Clark	964,609
Pipes, device for clearing waste, R. A. Sommerville	964,573
Planter, mint, F. H. Snyder	964,820
Plate bending apparatus, A. M. Saunders	965,018
Pliers, insulation cutting, H. A. Adams	964,600
Plow, F. E. Davis	964,702
Plow, C. W. Dickinson	964,766
Plow, J. A. Pankey	965,121
Plug, attachment, J. C. Daliam	964,619
Plug, separable attachment, H. Hubbell	964,803
Plumber's fitting, W. H. Perkins	965,008
Plunger case, multiple, A. M. Hance	965,138
Poke, animal, R. W. Crossman	964,758
Pole or post, metal and concrete, W. B. Chisholm	964,491
Post, H. Garfinkel	965,101
Powder and other explosives, apparatus for the manufacture of black, F. I. du Pont	964,550
Power generating apparatus, F. W. Lierman	964,923
Power transmitting means, C. Cletren	965,084
Pressure gage indicator R. E. Fields	964,654
Printing machines, device for cleaning the water tight blankets of cloth, F. X. Muller-Fichter	965,117
Printing presses, apparatus for moving paper rolls for, L. F. Pfister	964,546
Printing presses, means for supplying and feeding paper to, L. F. Pfister	964,547
Propelling system, electromagnetic, B. Dean	964,498
Pulley, T. Morrison	964,672
Pump, high pressure turbine, W. L. Forward	964,963
Pump, piston, J. M. Denson	965,132
Punch, etc., holder, T. H. Lewthwaite	964,922
Puzzle, J. W. Parker	964,688
Puzzle, T. A. Barnes	964,740
Rack. See Display rack.	
Radiator for automobiles, Long & Todd	964,790
Rail, compound, A. Berry	964,606
Rail fastener, J. A. & A. C. McMillen	964,675
Rail fastener, D. D. Norris	964,682
Rail fastening, W. A. Williams	964,726
Rail joint, C. C. Stockton	965,124
Railway crossing gate, S. H. Hartwell	964,911
Railway roadbed construction, C. B. Holden 964,519,	964,517
Railway signal, J. D. Roett	964,814
Railway signaling apparatus, P. H. Shue	964,028
Railway signaling device, P. H. Shue	964,569
Railway tie, C. B. Holden	964,515
Railway track structure, T. Lennox	964,981
Railways, current distributing and collecting mechanism for electric, F. G. Clark	964,953
Rake attachment for hay wagons, H. H. Howe	965,110
Rake attachment, sulky, J. T. Stauffer	964,577
Ratchet drill, D. Cortese	964,616
Receptacle filling machine, E. K. Hood	964,781
Receptacle or the like, C. H. E. Boughton	964,844
Receptacle with handle, F. Wegner	964,720
Reflector for electric lamps, adjustable, H. Hubbell	964,646
Refrigerator, E. D. Conroy	964,909
Register, F. A. Wilson	964,597
Ribbon feeding mechanism, Craig & Coffman	964,851
Rims, reinforced wood, E. J. Lobdell	964,984
Ring and flier doubling frame, Bent & Whiteley	965,065
Rock drill, H. J. H. Nathorst	964,875
Rock drill extractor, W. E. Weekes	965,054
Rock drills and the like, feeding mechanism for, G. R. Bennett	964,605
Rock gathering machine, C. C. Moore	965,115
Rod coupling, S. F. Williams	964,599
Rolling hollow metal bodies, method of and apparatus for, E. E. Slick	965,038
Rolling ingots, J. O. E. Trotz	965,050
Roof bracket, G. P. Wolf	964,829
Rope drive elevator, E. Boening	964,842
Rope drive elevator, L. H. Venn	964,889
Rope, junping, E. M. Deckman	964,623
Rotary engine, Chader & Anderson	964,754
Rotary engine, S. R. Nichols	964,593
Rotary shears, E. E. Slick 965,034,	965,037
Rubber articles, making hollow, F. J. Gleason	964,510
Saddletree, G. J. Hummel	964,864
Safe, Hall & Dwyer	964,861
Sand spouts, ice protector for, E. C. Loring	964,985
Sash attachment, window, L. J. Fishel	964,696
Saw, H. G. Aldridge	964,602
Saw clamp, W. R. Gates	964,508
Saw, drag, May & Shannon	964,669
Saw guide, band, H. B. Brueggemann	964,846
Sawmill carriage scraper, A. Reitz	965,013
Sawmill gearing, W. E. Carey	964,750
Scale relieving gear, A. W. Epright	964,854
Screen. See Window screen.	
Screen plate lock, Case & Marshall	964,753
Screw lock, C. B. Burrows	964,850
Seeding machine, F. E. Davis	964,761
Seeding machine gearing, Moon & Christman	964,802
Self closing gate, J. W. Martin	964,801
Sewing machine, lock stitch, H. H. Cummings	964,852
Shade holder, H. Hubbell 964,519,	964,520
Shaft coupling, D. M. Bliss	965,131
Sheet material, manufacture of compound, E. Kempshall	964,524
Sheet metal vessel, Reuter & Hatz	964,554
Sheet register device, E. Cheshire	964,756
Shingling bracket, B. F. Carr	965,078
Shock handling device, A. Engelhardt	965,092
Shoe, I. Bernat et al	964,482
Show case, A. J. Blyth	964,552
Shuttle, E. S. Stimpson	964,708
Sight feed lubricator, T. L. Swanberg	964,583
Signaling system, electric, J. D. Taylor	964,716
Signaling system, selective, H. O. Rugh	965,017
Signaling systems, impulse transmitter for electric, E. E. Clement	964,612
Signaling systems, track instrument for, MacDougal & Chambers	964,530
Silicon carbid, making, F. J. Tone	965,142
Skate, roller, T. Spacie	964,705
Skate, roller, H. P. Vasseller	964,825
Skinning tool, F. Jackson	964,863
Slasher, E. L. Morrill	964,531
Sled attachment, bob, C. Nelson	964,537
Slicing machine, vegetable and fruit, O. L. Johnson	964,515
Sliding bolt, J. G. Wainwright	964,948
Smoke consumer, L. Limoges	964,662
Snap catch for pocketbooks, handbags, etc., O. Greenbaum	964,641
Soap and brush holder, G. F. Salisbury	964,698
Soap, composition of matter for making soft, T. W. Nichols	964,538
Sodium peroxid compositions for washing and bleaching purposes, producing, P. Roser	965,016
Soldered cord or twisted chain, apparatus for automatically making, L. Bruckmann	965,071
Sound recording and reproducing machines, speed regulating device for, G. Oulton et al	964,684
Sound records and the matrices for making the same, making, J. W. Owen	964,686
Speculum, mouth, H. E. Caswell	965,079
Speed and distance recorder, Hutchinson & Grindrod	964,647
Speed changing mechanism, F. C. Brunhouse	964,847

Classified Advertisements

Advertising in this column is 75 cents a line. No less than four nor more than 10 lines accepted. Count seven words to the line. All orders must be accompanied by a remittance. Further information sent on request.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. There is no charge for this service. **In every case it is necessary to give the number of the inquiry.** Where manufacturers do not respond promptly the inquiry may be repeated.

MUNN & CO., Inc.

FOR SALE.

FOR SALE.—Wholly or in part a long established boat and engine plant, doing a large business, well located in Minnesota. Address Plant, Box 775, N. Y.

Inquiry No. 8918.—For manufacturers of "Wydt's Electro-Catalytic Sparking Plug."

WANTED.

WANTED.—Competent man to take entire charge of factory building gasoline engines. Must have had considerable experience in this line and best of recommendations. Address Box 231, Detroit, Mich.

Inquiry No. 8987.—Wanted, the manufacturers of the Van Winkle Woods & Sons, and the Weber power meters.

WANTED.—Exclusive sale New York territory for an advertising novelty, unique savings bank, or small price premium article. Address William A. Magill, 95 Liberty Street, New York.

Inquiry No. 9014.—For manufacturers of machinery, supplies, etc., to equip a small plant for the manufacture of iridium-tipped gold nib making for fountain pens.

PATENTS FOR SALE.

FOR SALE.—Patent No. 916,092. A new and useful improvement in railway switches. Address Joseph Williams, Cor. Walnut and Madison Sts., Ottawa, Ill.

Inquiry No. 9016.—Wanted, machinery necessary for an installation of a plant for refining salt by a modification of the Bessemer process.

Inquiry No. 9029.—Wanted, catalogues and all information on machinery for braiding straw in manufacturing straw hats.

PATENT No. 958,651.—Quick Detachable Wagon Skates for sale. Sets made to sell for ten dollars with big profits. Absolute necessity. Make a sleigh of any wagon in ten minutes. For particulars write to Max Aubertel, Cornwall-on-Hudson, N. Y.

Inquiry No. 9038.—Wanted, the address of the Chipman Electric Purifying Co.

OUTRIGHT SALE OR ON ROYALTY.—U. S. Patent No. 956,789. Canadian Patent No. 122,911. Envelop with special flap construction, which after sealing, it being impossible to gain access without leaving evidence that the envelop had been tampered with. For particulars address Neil J. Macdonald, Irish Cove, Nova Scotia, Can.

Inquiry No. 9060.—Wanted to buy machinery to manufacture seed corn racks.

FOR SALE PATENT No. 939,686.—Device for picking up and delivering mail in proportion. Works automatically. Will sell for fair price with patterns. H. J. Hall, 181 Van Horn St., Jersey City, N. J.

Inquiry No. 9075.—Wanted, to buy small weather vanes, such as can be used as ornaments on lightning rod tops. Aluminum preferred.

TYPEWRITERS.

TYPEWRITERS.—Every make, each entirely rebuilt and refinished; guaranteed satisfactory or may be returned. Illustrated list free. Agents' discounts. Typewriter Clearing House Co., 347 Broadway, New York City.

Inquiry No. 9076.—Wanted, the address of parties in Canada who could make a safety razor.

MISCELLANEOUS.

WONDERFUL DISCOVERY.—Any bottle made non-refillable by a wonderfully simple, practical device. Cost about two cents to make, operates sticky liquids with heavy flow, refilling an impossibility in whole or part by any trick, gives absolute protection. Greatest bottle invention in existence, models thoroughly tested. Capital can buy or finance invention. Address W. Robinson, 344 Chauncey Street, Brooklyn, N. Y.

Inquiry No. 9077.—Wanted, the address of manufacturers of sewer pipe, made of fiber and asphaltum, suitable for laboratory use.

LISTS OF MANUFACTURERS.

COMPLETE LISTS of manufacturers in all lines supplied at short notice at moderate rates. Small and special lists compiled to order at various prices. Estimates should be obtained in advance. Address Munn & Co., Inc., List Department, Box 773, New York.

Inquiry No. 9094.—Wanted address of The Thomas Arithometer Company, also Burkhart Arithometer Company.

SALE AND EXCHANGE.

A LIST OF 1,800 mining and consulting engineers on cards. A very valuable list for circularizing, etc. Price $15.00. Address Munn & Co., Inc., List Department, Box 773, New York.

Inquiry No. 9099.—Wanted, address of manufacturers of machinery for making wire cables.

Inquiry No. 9109.—Wanted addresses of the manufacturers of the Dion Desk Clock.

Inquiry No. 9113.—Wanted name and address of the manufacturers of the Russell Patent Automatic Ink Well.

Inquiry No. 9115.—Wanted a machine for making pen nibs, similar to Wm. Mitchell's G. & J. nibs and Waverly nibs.

Inquiry No. 9120.—Wanted, the address of the Otoni Fuel Feeder Co.

Inquiry No. 9127.—Wanted, a device that will braid leather strips for horse whips.

Inquiry No. 9128.—Wanted, the address of manufacturers of machines capable of forming a number (12 or more) of pieces of paste about 26 mm. x 32 mm. x 6 mm., made of lead oxide and sulphuric acid, and placing them into a frame having a separate compartment for each piece, the space between each piece and the next being all round 4 mm. The process could be somewhat similar to biscuit making.

Inquiry No. 9142.—Wanted, name and address of the manufacturers of an air mattress.

Inquiry No. 9144.—Wanted, manufacturers of machinery for making soda water tubes, commonly known as straws.

Inquiry No. 9145.—Wanted, to buy machinery to load blasting caps or detonators.

Inquiry No. 9152.—Wanted, the address of the Graham Safety Lamp Filler and Ventilator.

Inquiry No. 9153.—Wanted, name and address of manufacturers of a knotless clothes line.

Inquiry No. 9155.—Wanted, the address of manufacturers of an electric milking machine.

Inquiry No. 9163.—Wanted, manufacturers of a cradle worked by clock work.

Inquiry No. 9167.—Wanted, the address of the German Quartz Co.

Inquiry No. 9168.—Wanted, the name of manufacturer making the Moore Eureka Spring Terminal, sometimes called spring clip.

ADDS MULTIPLIES Comptometer DIVIDES SUBTRACTS
In A Class By Itself

What would it be worth to you

to verify your postings daily in a few minutes?

To extend all outgoing and check all incoming bills.

Figure simple and chain discount in ¼ the time?

Figure inventory in ¼ the time? Your records show what it is costing you. Just suppose you could put ¼ of such cost to your gain account. The Comptometer will do all this for you.

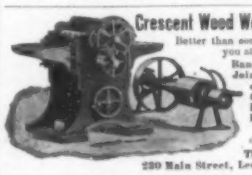
A trial will convince you that the Comptometer is the best dividend payer you ever saw.

It does not take many minutes saved or errors prevented in a week to make the Comptometer a profitable investment.

We would like to tell you more but space won't permit.

Let us send you a book about it, free? Or, let us send you a Comptometer on free trial, prepaid, U. S. or Canada?

Felt & Tarrant Mfg. Co., 1708 N. Paulina St., Chicago



Crescent Wood Working Machinery

Better than some that may be offered you at a higher price

Band Saws, Saw Tables, Jointers, Shapers, Borers, Swing Saws, Disk Grinders, Planers, Planer and Matcher, Band Saw Blades.

Send today for free catalog.

The Crescent Mach. Co.
230 Main Street, Leetonia, Ohio, U. S. A.

TEMAGAMI

THE GREAT NORTH COUNTRY

Those Indians who made the first canoe of birch bark long ago, were our greatest benefactors. The children of these Indians know the canoe, and they know how to use it, and if you go to Temagami, Ontario, this summer they will paddle your canoe in their own superb way. Students who camp in summer along the Temagami lakes are able to do two years work in one. Finest of fishing and hunting. Easy of access by the Grand Trunk Railway System. Information and beautiful descriptive publication sent free on application to F. P. Dwyer, 290 Broadway, New York.

THE BEST EQUIPPED SHOP
For Mechanical and Electrical Manufacturing
Special Machinery, Jigs, Tools, Repairs, Experimental Devices
Designing and Commercializing a Specialty
THE ROWLAND TELEGRAPHIC COMPANY, Baltimore, Md.

UNIVERSAL SCRAPER

Neatest, simplest and best on the market. Eight sharp cutting edges, each brought instantly into use by ball joint connection. Easily locked or released by turning handle.

PRICE $1.00

Send for 232 page catalog No. 18-B.

THE L. S. STARRETT CO., Athol, Mass., U. S. A.

HOLTZER-CABOT MAGNETOS

Rugged, Durable and Highly Efficient. For Automobiles, Motor Boats, etc.

Send for Bulletin No. 1587.

THE HOLTZER-CABOT ELECTRIC CO. BROOKLINE, MASS. CHICAGO, ILL.

WELL DRILLING MACHINES

Over 70 sizes and styles, for drilling either deep or shallow wells in any kind of soil or rock. Mounted on wheels or on sills. With engines or horse powers. Strong, simple and durable. Any mechanic can operate them easily. Send for catalog.

WILLIAMS BROS., Ithaca, N. Y.

Industrial Alcohol

Its Manufacture and Uses

By JOHN K. BRACHVOGEL, M.E.

Size 6¼ x 8¼ inches. 528 pages, 107 illustrations. Price $4.00, postpaid.

A PRACTICAL treatise based on Dr. Max Maercker's "Introduction to Distillation," as revised by Drs. Delbruck and Lange, comprising raw material, malting, mashing and yeast preparation, fermentation, distillation, rectification and purification of alcohol, alcoholometry, the value and significance of a tax-free alcohol, methods of denaturing, its utilization for light, heat and power production, a statistical review, and the United States law. The present work is based upon the researches and writings of the most eminent of Germany's specialists in the science of fermentation and distillation. It covers the entire manufacture of alcohol from the raw materials to the final rectified and purified product. It also contains chapters on the methods of denaturing, domestic utilization of alcohol for heating and and lighting purposes, and alcohol as a fuel for power production. An illustrated circular and table of contents of this book will be sent on application.

MUNN & CO., Inc., Publishers
361 Broadway, New York

(Continued from page 93.)

self-contained circulation system, and this will be practically universal on the 1911 models. The oil is contained in a compartment that is usually integral with the crank case. An interesting feature is a float resting on the oil, and operating an indicator located in plain sight on the engine. This is a great improvement over the former designs that provided a gage glass located inaccessibly on the lower side of the crank case.

The great advances that have been made by the manufacturers of carbureters have induced many automobile makers to abandon their own designs in favor of commercial types. It may be added that an extension of this practice would result in an improvement in many otherwise good cars.

Jump spark ignition has become practically universal, with a high tension magneto as the source of current. In many cases a battery and coil system will be provided in addition, operating either on the same plugs as the magneto, or on a separate set, but in any case, this is only to render easier the starting of the engine. The battery coil is usually so arranged that the pressing of a button will produce a spark in the cylinder that is on the firing stroke, and if mixture is present the engine thus becomes self starting. The use of a high tension magneto on small engines permits the spark to be fixed; that is, no arrangement is necessary for varying the relation between the magneto and the crank shaft when the engine speed changes. This greatly simplifies the control, and the system has been widely adopted.

The simplicity of the thermo-syphon or gravity system of water circulation is an attractive feature, and for 1911 its use will be much more general than was the case in 1910. With properly designed passages and an efficient radiator, it is in no respect inferior to the force system, and its first cost is, of course, considerably less. Those makers who still use the force system have adopted pumps of the centrifugal type, which may now be considered as the standard.

The multiple disk clutch has not lost in popularity, but it is noticeable that many of the designs have been simplified. As far as the change speed gear and transmission are concerned, they differ but slightly from the 1910 models, and such changes as have been made are for an increase in accessibility. That there is room for improvement in this direction is indicated by the number of instances in which it is still necessary to remove twelve nuts or even more in order to gain access to the gear case.

This matter of accessibility is one that some makers have studied, while others have neglected it to an astonishing degree. For an example, the draining of the crank case at regular intervals is of such importance to the life of an engine that a manufacturer would be supposed to render the operation an easy one, but in some cases it is necessary to remove the sod pan and to use a wrench to unscrew the drain plugs in order to accomplish it. An instance of this sort may be extreme, but it is a fact that when drain cocks are provided they are usually so located that it is necessary to get under the car in order to reach them. In a French car that was exhibited at the Automobile Show in January, 1909, the drain cocks could be operated by a handle located on the upper side of the crank case. It is strange that so simple and inexpensive a device has not been generally adopted.

A notable advance over the designs of previous years is the providing of the oil tank with an opening of such size that oil may be poured in without the aid of a funnel. The radiator manufacturers might well adopt a similar design, and make it the rule to provide openings large enough to permit water to be poured in from a bucket. A few cars are so arranged, but it is far from being standard practice.

The new cars will in many cases show

(Concluded on page 95.)

Home-Made Experimental Apparatus

In addition to the following articles, the **Scientific American Supplement** has published innumerable papers of immense practical value, of which over 17,000 are listed in a carefully prepared catalogue, which will be sent free of charge to any address. Copies of the **Scientific American Supplement** cost 10 cents each.

If there is any scientific, mechanical, or engineering subject on which special information is desired, some papers will be found in this catalogue, in which it is fully discussed by competent authority.

A few of the many valuable articles on the making of experimental apparatus at home are given in the following list:

ELECTRIC LIGHTING FOR AMATEURS. The article tells how a small and simple experimental installation can be set up at home. **Scientific American Supplement 1551.**

AN ELECTRIC CHIME AND HOW IT MAY BE CONSTRUCTED AT HOME, is described in **Scientific American Supplement 1566.**

THE CONSTRUCTION OF AN ELECTRIC THERMOSTAT is explained in **Scientific American Supplement 1566.**

HOW TO MAKE A 100-MILE WIRELESS TELEGRAPH OUTFIT is told by A. Frederick Collins in **Scientific American Supplement 1605.**

A SIMPLE TRANSFORMER FOR AMATEUR'S USE is so plainly described in **Scientific American Supplement 1572** that anyone can make it.

A ¼-H.-P. ALTERNATING CURRENT DYNAMO. Scientific American Supplement 1558.

THE CONSTRUCTION OF A SIMPLE PHOTOGRAPHIC AND MICRO-PHOTOGRAPHIC APPARATUS is simply explained in **Scientific American Supplement 1574.**

A SIMPLE CAMERA-SHUTTER MADE OUT OF A PASTEBOARD BOX, PINS, AND A RUBBER BAND is the subject of an article in **Scientific American Supplement 1578.**

HOW TO MAKE AN AEROPLANE OR GLIDING MACHINE is explained in **Scientific American Supplement 1582,** with working drawings.

EXPERIMENTS WITH A LAMP CHIMNEY. In this article it is shown how a lamp chimney may serve to indicate the pressure in the interior of a liquid; to explain the meaning of capillary elevation and depression; to serve as a hydraulic tourniquet, an aspirator, and intermittent siphon; to demonstrate the ascent of liquids in exhaustive tubes; to illustrate the phenomena of the bursting bladder and of the expansive force of gases. **Scientific American Supplement 1583.**

HOW A TANGENT GALVANOMETER CAN BE USED FOR MAKING ELECTRICAL MEASUREMENTS is described in **Scientific American Supplement 1584.**

THE CONSTRUCTION OF AN INDEPENDENT INTERRUPTER. Clear diagrams giving actual dimensions are published. **Scientific American Supplement 1615.**

AN EASILY MADE HIGH FREQUENCY APPARATUS WHICH CAN BE USED TO OBTAIN EITHER D'ARSONVAL OR OUDIN CURRENTS is described in **Scientific American Supplement 1616.** A plunge battery of six cells, a two-inch spark induction coil, a pair of one-pint Leyden jars, and an inductance coil, and all the apparatus required, most of which can be made at home.

SIMPLE WIRELESS TELEGRAPH SYSTEMS are described in **Scientific American Supplements 1363** and **1381.**

THE LOCATION AND ERECTION OF A 100-MILE WIRELESS TELEGRAPH STATION is clearly explained, with the help of diagrams, in **Scientific American Supplement 1622.**

THE INSTALLATION AND ADJUSTMENT OF A 100-MILE WIRELESS TELEGRAPH OUTFIT, illustrated with diagrams, **Scientific American Supplement 1623.**

THE MAKING AND THE USING OF A WIRELESS TELEGRAPH TUNING DEVICE. Illustrated with diagrams, **Scientific American Supplement 1624.**

HOW TO MAKE A MAGIC LANTERN. Scientific American Supplement 1546.

THE CONSTRUCTION OF AN EDDY KITE. Scientific American Supplement 1555.

THE DEMAGNETIZATION OF A WATCH is thoroughly described in **Scientific American Supplement 1561.**

HOW A CALORIC OR HOT AIR ENGINE CAN BE MADE AT HOME is well explained, with the help of illustrations, in **Scientific American Supplement 1573.**

THE MAKING OF A RHEOSTAT is outlined in **Scientific American Supplement 1594.**

Good articles on SMALL WATER MOTORS are contained in **Scientific American Supplement 1494, 1049, and 1406.**

HOW AN ELECTRIC OVEN CAN BE MADE is explained in **Scientific American Supplement 1472.**

THE BUILDING OF A STORAGE BATTERY is described in **Scientific American Supplement 1433.**

A SEWING-MACHINE MOTOR OF SIMPLE DESIGN is described in **Scientific American Supplement 1210.**

A WHEATSTONE BRIDGE, Scientific American Supplement 1595.

Good articles on **INDUCTION COILS** are contained in **Scientific American Supplements 1514, 1522,** and **1527.** Full details are given so that the coils can readily be made by anyone.

HOW TO MAKE A TELEPHONE is described in **Scientific American Supplement 906.**

A MODEL STEAM ENGINE is thoroughly described in **Scientific American Supplement, 1527.**

HOW TO MAKE A THERMOSTAT is explained in **Scientific American Supplements 1561, 1563,** and **1566.**

ANEROID BAROMETERS, Scientific American Supplements 1500 and **1554.**

A WATER BATH, Scientific American Supplement 1464.

A CHEAP LATHE UPON WHICH MUCH VALUABLE WORK CAN BE DONE forms the subject of an article contained in **Scientific American Supplement 1562.**

Each number of the **Scientific American Supplement** costs 10 cents by mail.

Order from your newsdealer or from

MUNN & CO., Inc., 361 Broadway, New York

(*Concluded from page 94.*)

an increase in the wheel sizes, but this is an advantage, as it improves the easy riding qualities and reduces the tire maintenance costs. Some concerns will supply demountable rims, while a far larger number will make some form of quick detachable rim the standard equipment of their cars. In some of the higher priced cars, air pumps driven by the engine are provided for tire inflation, and this is a feature that is deeply appreciated. The pneumatic tire is the *bête noir* of the automobile, and any device that renders its handling less laborious is sure of speedy adoption.

Automobile manufacturers have learned by experience that it is poor economy to equip their cars with cheap accessories, and it is noticeable that the 1911 lamps, horns, tops, etc., are of much higher quality than has been used in the past. The accessories mentioned will be the standard equipment of a large proportion of the new cars and in addition a wind shield, shock absorbers, a speedometer and a clock may be offered. The average purchaser prefers to pay a fixed price for the car complete, rather than be obliged to place separate orders for accessories that are virtually necessities.

Taken all in all, the 1911 cars will offer greater comfort and convenience than their predecessors, and while costs show a slight upward tendency, the purchase price includes a better grade of design, material and workmanship than has been obtainable in the past.

MOTION PICTURES OF INSECTS.

(*Concluded from page 84.*)

opened the mica door, and thus broke the circuit. At this moment the operator closed a second break in the circuit. When the insect had taken wing, the mica door fell shut, and re-established the connection, opening the camera shutter and causing a series of pictures of the flight to be impressed on the moving film. For Coleoptera (beetles), which hesitate still longer before taking flight, the arrangement described above was replaced by a little horizontal plate of aluminium, balanced by a counter-poise. The end of this plate projects slightly from the end of the glass tube. When the insect, in crawling out of the tube, reaches the end of the plate and flies away, the counterpoise descends and closes the circuit.

By means of these very ingenious devices, Bull has obtained admirable motion pictures, which have demonstrated some very interesting facts. In particular, he finds that the motions of the wings of all insects present the same general character. Let us, for example, follow the evolutions of a dragon-fly. On commencing its flight the insect first depresses its anterior and then its posterior wings, at the same time bringing them in front of the head. The end of the wing describes a curve, concave above and in front, with its general direction inclined about 45 degrees to the line of flight. When the wing has arrived at the end of its course, it describes a loop of greater or less breadth, and returns to its poinf of departure. The posterior wings describe a similar course, but always lag behind the anterior wings. In all of the insects studied by Bull the return course of the wing intersects the outward course, forming a figure of 8. The width of the two loops of the 8 vary in the same individual, according to circumstances. It is very remarkable that the frequency of the wing-beats varies very little in normal conditions. When the insect takes flight, its first wing-beats have an amplitude much smaller than that of the subsequent ones, but the period remains almost unchanged. The insect regulates the velocity of its flight, not by the rapidity of the motions of its wings, but by changing their inclination. Although in normal conditions the period of the wing-beat remains constant, it is increased by fatigue and by cold, and is diminished by various influences.

The Best Typewriter That Money Can Buy

Costs One Hundred Dollars and its name is

Remington

The cost of a good operator during the average life of a Typewriter is Several Thousand Dollars. And remember that no operator can do the most work or the best work except on the best machine Compare your outlay for the machine with your outlay for the operator and you will see why it is true economy to buy the Remington.

Remington Typewriter Company
(Incorporated)
New York and Everywhere

SEALED PROPOSALS.

WANTED—One second-class structural steel work draftsman at $5.04 per diem, two first-class assistant structural steel work draftsmen at $4.00 per diem and one third-class assistant structural steel work draftsman at $3.52 per diem. A competitive examination will be held August 10, 1910, for the purpose of filling the above positions. For further information address "Commandant, Navy Yard, Brooklyn, N. Y."

ICE MACHINES Corliss Engines, Brewers and Bottlers' Machinery. THE VILTER MFG. CO., 899 Clinton St., Milwaukee, Wis.

MODELS & EXPERIMENTAL WORK. Inventions developed. Special Machinery. E. V. BAILLARD CO., 24 Frankfort Street, New York.

CONSULTING ENGINEER.
ERNEST L. RANSOME
Reinforced Concrete
910 Madison Avenue, Plainfield, N. J.

Patented Articles and Metal Specialties
MANUFACTURED BY CONTRACT
Stamping Dies, Metal Stampings and Screw Machine Work
H. CARSTENS MFG. CO., 565 W. Lake St., Chicago

SOUTHERN STAMPING & MFG. CO.
Manufacturers of special and patented articles.
E. S., Nashville, Tenn.

RUBBER Expert Manufacturers Fine Jobbing Work
PARKER, STEARNS & CO., 288-290 Sheffield Av., B'klyn, N. Y.

NOVELTIES & PATENTED ARTICLES
MANUFACTURED BY CONTRACT. PUNCHING DIES, SPECIAL MACHINERY.
E. KONIGSLOW STAMPING & TOOL WORKS, CLEVELAND, O.

WANTED—To manufacture small machines, or parts; punch press, screw machine, lathe, shaper and multiple drill spindle work quoted on at reasonable prices.
ROTARY FILE AND MACHINE COMPANY
General Machinists 200 Diamond Street, Brooklyn, N. Y.

Manufacturer of Patented Articles, Models, Tools, Dies, Jigs, Special Machinery, Experimental Devices, Novelties, etc.
CHAS. E. DRESSLER, 382-390 2d Ave., New York

Aluminum Can Be Soldered
to itself or to other metals. We guarantee the joint to be stronger than the original metal.
SAMPLE BAR, POSTPAID, 50 CENTS
STANDARD LEATHER WASHER MFG. CO., Newark, N. J.

American Homes and Gardens

CONTENTS FOR AUGUST, 1910

The Court at "Harbour Court" . . . . . Frontispiece
"Harbour Court," the Residence of Mrs. John Nicholas Brown at Newport, R. I. by Bart Ferree
Bernard Palissy, the Famous French Potter and His Works . Chas. A. Brassler
"Crystal Brook." A Co-operative Colony. . . . . Jerome Walker, M.D.
Decorations and Furnishings for the Home—VI. The Arrangement and Hanging of Pictures . . . . . Alice M. Kellogg
Some Notable Garages . . . . . Robert Prescott
Flowers as Dessert . . . . . Monica Bastin
Some Novel French Chimney Pots . . . . . Frances B. Sheafer
"A Nook in a Formal Garden" . . . . . .
Furniture for the Home—Garden Furniture . . . . . Esther Singleton
The Handicraftsman—Methods of Beautifying the Common Gas Light Catherine A. Jensen
Making Plumes Out of Crepe Paper . . . . . Ethel Jones
Imitation Marble . . . . . A. J. Jarman
The Modern House . . . . . Paul Thurston
Garden Notes . . . . . Charles Downing Lay
The Heliotrope as a Bedding Plant . . . . . Ida D. Bennett
Vegetable Fountains . . . . . W. R. Gerard

NEW BOOKS—Canning and Preserving Fruits, Hints for the Housewife

American Homes and Gardens can be purchased from news stands

PRICE 25 CENTS $3.00 A YEAR

PUBLISHED MONTHLY BY

MUNN & CO., Inc., 361 Broadway, New York City, N. Y.

Springs, machine for tapering coiled, G. H. Scott 964,701
Spoke tenoning machine, G. Avery 964,738
Spring wheel, J. Lee 964,979
Spring wheel, J. P. Paulissen 965,122
Square, N. B. McGrath 964,988
Square, J. W. Beardoff 965,088
Steam exhaust head, W. H. Thomas 964,584
Steel, manufacture of, C. M. Johnson 964,869
Steering gear, boat, A. G. Park 964,879
Sterilizing hopper, A. C. Badger 964,858
Stocking turning machine, W. H. Ernentrout 964,959
Stone, apparatus for forming artificial, A. A. Pauly 965,002
Stone articles, making artificial, A. A. Pauly 965,007
Stone building bricks or blocks, compound for making artificial, R. E. Pelot et al. 964,544
Stone cutting machine, E. A. Chase, reissue 13,134
Stool, G. Konstantinides 965,113
Storage battery, P. M. Marko 964,965
Stove, S. G. Hensley 964,913
Stoves, gas burning attachment for, A. Clausing 964,611
Stoves, oil gas generator and burner for, J. F. Harrell 964,775
Street or station indicator, H. Alwies 964,855
Street sprinkling system, J. H. Carmack . . 965,077
Sulky, trotting, J. H. Dickson 965,183
Surveying instrument clamp, P. R. Heer . . . 964,776
Switch actuating mechanism, P. W. Leon . . 964,601
Switch lock, A. T. & G. J. Hanson 964,910
Switch throwing device, D. H. Sitz 964,571
Syringe, J. H. L. Eager 964,760
Syringe, J. L. Fisher 964,903
Syringe, faucet, C. F. Ackerman 964,730
Syringe, hypodermic, A. A. Allinger 964,950
Table lock, pool and billiard, J. M. Stivers 964,581
Tabulating and check indorsing apparatus, combined, J. H. Whitelaw 964,723
Tabulating and indorsing apparatus, combined, J. H. Whitelaw 964,724
Talking machine sound record, J. W. Owen 964,685
Tamping bar, J. A. Moore 964,671
Teaching device, music, M. S. Whitman . . . 964,893
Teaching device, swimming, C. G. Sickels. 964,886
Telegraphy, space, C. D. Babcock 965,089
Telephone receiver, W. W. Dean 964,622
Telephone service, system and apparatus for measuring, Stroud & Mahon 965,047
Telephone system, intercommunicating, W. W. Hawkins 964,513
Telescope sight, F. L. Smith 964,703
Tension device, spring, A. H. Kirk 964,651
Tent, F. A. Leavitt 964,796
Threshing machine, G. E. M. Guy-Bernard 964,960
Threshing machines, knife grinding attachment for, E. Beeson 964,839
Tie plates, manufacture of, W. Goldie, Jr. 964,511
Tile making machine, A. A. Pauly 965,004
Tile, manufacture of, A. A. Pauly 965,003
Tinning system, T. S. Bindschedler 964,743
Tire armor, pneumatic, C. E. Huxley 964,783
Tire heater, U. H. Laurin 964,795
Tire protector, J. L. La Driere 964,977
Tire, resilient, I. O. Wilson 964,727
Tires, tool for putting on and removing pneumatic, L. F. Carle 965,070
Tobacco lath, C. G. Wells 965,055
Tobacco smoke, smoking filter for the removal of the impurities from, L. Campo 964,489
Tombstone, E. A. Newman 965,000
Tool, combination, N. McAslan 964,552
Tool, expansion, A. Soderlund 964,704
Tool, jointed, W. B. Gardner 964,907
Torch, plumber's, W. Gierth 965,136
Toy bird, flying, W. S. Olson 964,803
Toy, detonating, F. J. Lyman 964,529
Toy, mechanical, C. Ross 964,569
Track, portable, E. A. Akerson 964,601
Track for cars, swing motion, C. D. Young 964,854
Tubing, machine for making flexible, F. Wilkie 964,595
Tug fastener and detacher, I. Jones 964,648
Turntable, automatic, C. W. Hillenbrand . . 964,514
Turpentine and rosin from resinous woods, apparatus for extracting, H. T. Yaryan 964,728
Tweezers, A. S. Knapp 964,526
Type casting and composing machine, Nicholas & Ackerman 964,677, 964,679
Type composing machine, Nicholas & Ackerman 964,678
Typewriters, duplicating device for, C. E. Foster 964,827
Typewriting machine, C. Gabrielson 964,628
Typewriting machine, G. F. Stillman 964,822
Typewriting machine, S. Nielsen 964,878
Typewriting machine, A. Lindenberg 964,924
Typewriting machine, W. J. Barron 965,061
Typewriting machine platen, R. W. Wolff. 964,590
Undergarment, C. S. Rogers 964,937
Utensil support, F. Kuhn 964,655
Vacuum producing apparatus, L. W. Serrell 965,025
Valve, C. A. Hultquist 964,970
Valve, C. Walker 965,129
Valve cutter and valve seat reamer, combined, S. M. Trammell 965,049
Valve mechanism, automatically controlled, T. J. Yates 964,833
Valve operating mechanism for explosive engines, exhaust, W. H. & F. M. Spayd 964,706
Vamp and quarter forming machine, A. Straub 965,046
Vapor burner, E. M. Byers 965,074
Vehicle, motor, W. Christie 965,083
Vehicle steering and cranking mechanism, motor driven, B. C. Ribbet 965,014
Vehicle suspension arrangement, road, F. Walton 964,589
Vehicle wheel, S. Z. de Ferranti 964,632
Vehicles, coin control for motor, A. P. Browne 964,845
Vending machine, Werden & Coe 964,591
Vending machine, H. W. Lundquist 964,588
Violin bow, W. G. Byrant 965,072
Voting machine, C. L. Lorraine 964,986
Wall, T. K. Smith 964,942
Walls, apparatus for the construction of plastic, H. C. Balsel 964,604
Washing machine, J. F. Hoglund 964,778
Washtub, sink, and drain board cover, combined, H. A. Fredenhagen 964,857
Watch pocket, M. W. Dana 964,620
Water closet seat, J. H. Becker 965,065
Water cooler, R. W. Ammons 964,734
Water elevating apparatus, R. H. Richardson 964,693
Water heater, O. Fox 965,100
Water or other fluid, means of regulating, treating, and distributing, D. Cochrane 964,613
Waterwheel, current, G. A. Hiesse 965,108
Welding purposes, transportable clamping apparatus for, Goldschmidt & Lange . 964,640
Wheels, anti-skidding device for vehicle, M. Clark 964,670
Wheels, manufacture of, E. E. Slick 965,032, 965,035
Wheels or circular bodies having peripheral treads, making, E. E. Slick 965,037
Whip socket and lock, M. P. Baldenger . . . 964,594
Winding device, rope, A. L. Fahrenholz . . 965,146
Window and sash frame, metallic, J. F. Weitzel 964,590
Window frame, A. H. Newpher 964,932
Window screen, A. Scharlandt et al 964,700
Wire cable cutter, Grandchamp & Barnard 964,809
Wire stretcher, J. H. Ragger 964,552
Yarn stripper, J. B. Bolton 964,494

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since October 4th, 1869, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., Inc., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., Inc., 361 Broadway, New York.

"TWIN GRIP"
PAPER FASTENER

Small Smooth Strong

Lets Nothing Slip

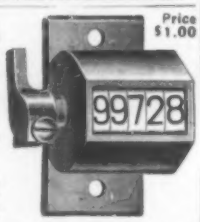
Free samples, 5 sizes, sent on request.
The De Long Hook & Eye Co.
Philadelphia

Veeder Counters

to register reciprocating movements or revolutions. Cut full size. Booklet Free.

VEEDER MFG. CO.
18 Sargeant St., Hartford, Conn.
Cyclometers, Odometers, Tachometers, Counters and Fine Castings.

Represented in Great Britain by Marey & Co., Limited, 4 City Road, Finsbury Square, London, E. C.; France, by Marey & Co., London, 167 Avenue Parmentier, Paris; Germany, Austria-Hungary and Scandinavian Countries by Ludw. Loewe & Co., Hatten-Strasse 17-20, Berlin.



Price $1.00

LEARN TO BE A WATCHMAKER

Bradley Polytechnic Institute
Horological Department
Peoria, Illinois
Formerly Parsons Horological Inst.
Largest and Best Watch School in America

We teach Watch Work, Jewelry, Engraving, Clock Work, Optics. Tuition reasonable. Board and rooms near school at moderate rates. Send for Catalog of Information.

Bristol's Recording Thermometers

For all Commercial Ranges of temperature up to 800° F. Write for new Bulletin No. 123, showing specimen records of Feed Water Temperatures.

The Bristol Company
WATERBURY, CONN.

PHOTOGRAPHY

Unique and interesting booklet
"HOW and WHY in PHOTOGRAPHY"
Mailed free on request
Burroughs Wellcome & Co.
35, West Thirty-third Street, N.Y.
or 101, Coristine Bldg., Montreal

MONTREAL AND QUEBEC

A veritable edition de luxe among railroad pamphlets has been issued by the Grand Trunk Railway System to proclaim amongst tourists the glories of the cities of Montreal and Quebec. The brochure is beautifully printed and generally arranged in the artistic style of earlier days, when the ornamentation of a volume was regarded as an important incident to its presentation of reading matter. It gives an interesting description of the two most interesting cities in Canada, with many illustrations from photographs. Sent free to any address. Apply to F. P. Dwyer, 290 Broadway, New York.

The Rapid

"Built for Business"

Deliver goods with this car and save money. Cheaper than horses. Figures to prove it, free. Goyert & Co., Greensburg, Ind., say:

"*Rapid* saves $90 a month over cost of horses."
Rapid Motor Vehicle Co., 724 Rapid St., Pontiac, Mich.

The Ball Transmission
FOR
Automobiles & Motor Boats
NEW YORK GEAR WORKS

Incorporate Your PATENTS and BUSINESS in ARIZONA

Laws the most liberal. Expense the least. Hold meetings, transact business anywhere. Blanks, By-Laws and forms for making stock full-paid for cash, property or services, free. President Stoddard, FORMER SECRETARY OF ARIZONA, resident agent for many thousand companies. Reference: Any bank in Arizona
STODDARD INCORPORATING COMPANY, Box 8000
PHOENIX, ARIZONA

DIE MODELS SPECIAL
WORK TOOLS MACHINERY
NATIONAL STAMPING AND ELECTRIC WORKS
1003 Jefferson Street, Chicago, Ill.

HELMET OIL
LUBRICATES ANYTHING
SEND FOR SAMPLE FREE
118-124 North Clinton St.
CHESLEY & CO. CHICAGO, U.S.A.

Go to a HAYNES Dealer and See This 1911 Car

Another Remarkable Haynes Car

In 1909 we startled the motor world by placing the Haynes "Model 19" five-passenger touring car on the market at the astonishingly low price of $2,000.

The effect upon the trade and the public was instantaneous. Within 30 days from the time our first announcement had appeared in the National Magazines we had **definite, advance payment orders** for more cars than we could make.

This new model not only appealed to the man who was considering paying $3,000 for a car, and who saw in this Haynes an opportunity of saving $1,000 on his purchase—

But it appealed to the man who found that by paying only $500 more than the cost of a **temporary** car of common quality, it was possible for him to get a car of **known** quality and reputation that would prove a **permanently satisfactory investment.**

HAYNES

Probably no other car that has ever been on the market has been as critically examined by experts as was this new Haynes.

Other manufacturers of high-grade cars were anxious to know what manner of car this "Model 19" was, and the **one** criticism that was made was that **it was financially impossible to put out a car of the Haynes "Model 19" at $2,000 and make a profit.**

They predicted that either it would be necessary for us to reduce the quality or increase the price

We have done neither.

Aside from minor **improvements**—a wider, roomier, tonneau, longer wheel base, etc.—the car remains unchanged, and it also remains **the most remarkable automobile value ever put on the market.**

The Haynes "Model 20" for 1911

This is the latest model of the car that marked a new era in the purchase price of high-grade cars.

It has 35-40 horse power.

It has a longer, roomier tonneau than last year's model.

It has 114-inch wheel base.

It is not only **fully equipped,** but the equipment is of the **best grade obtainable.**

For example, every car will be supplied with the well-known Warner Auto Meter—costing three times as much as most of the speed indicators that are put on cars. (Only a speed indicator of this quality is entitled to be **put on a car like the Haynes.**)

All other equipment is of like character.

Last year's phenominal response to our announcement of a **Haynes at $2,000** convinced us that the large majority of buyers prefer a car of **known** quality if it can be had at **anywhere near** the price asked for common-quality cars.

And the fact that the 1910 Haynes was the first serious attempt to meet this demand gave the car a decidedly enviable place among the better grade cars.

This year's "Model 20" with its **added refinements,** is the best possible evidence that we propose to **maintain the Haynes supremacy.**

Orders are already in for early Fall deliveries on these cars, and we strongly advise those who are contemplating the purchase of a **permanent** car of **known** merit and reputation, to communicate with us, or our local representatives, **at once.**

We will also put out a limited number of big seven-passenger palace cars, with fifty-horsepower, for those who prefer a car of this size.

HAYNES AUTOMOBILE COMPANY, 124 MAIN STREET KOKOMO, INDIANA

$2,000 Fully Equipped

Top, Dust Hood, Glass Front, Presto-Light Tank, $75.00 Warner Auto Meter, Bosch Dual System Magneto, Robe and Foot Rail, Gray & Davis Lamps—and All

MADE IN TOURING, SUBURBAN AND HIKER MODELS

THE "BEST" LIGHT

More brilliant than electricity or acetylene and cheaper than kerosene. Costs two cents per week. **Casts no shadow.** Most perfect light for stores, factories, churches, public halls or the home. Makes and burns its own gas. Simple, durable and handsome. In use in every civilized country in the world. No dirt. No grease. No odor. Over two hundred different styles. Agents wanted everywhere. Write for catalog and prices.

THE BEST LIGHT CO.
87 E. 5th St., Canton, O.

"POROX"
Storage Batteries

The best for ignition and light. No loss of current. Absolutely reliable. Transparent jars are used for all batteries. 6 volt, 60 ampere hour battery. **Price $27.00.**
Send for catalogue
ALBERT MÜLLER
145 West 49th Street, New York

LUFKIN
TAPES AND RULES
ARE THE BEST.
For sale everywhere. Send for Catalog No. 16.
LUFKIN RULE CO.
Saginaw, Mich., U. S. A.
New York and London.

ALOE—For Sixty Years the Standard of the World for Quality. Established 1850—ALOE

Civil Engineering and Surveying Instruments

DRAWING MATERIALS AND SUPPLIES

BLUE PRINT PAPER, TRACING CLOTH, ETC.

"FREE" Write for Catalogue Sent "FREE"

A. S. ALOE CO., 507 Olive Street, St. Louis, Mo.

Chicago Beach Hotel

American Plan | Finest Hotel on the Great Lakes | European Plan

An ideal resort uniting all city gaieties with the quiet of country and seashore. Delightfully situated on the shore of Lake Michigan close to the great South Park—10 minutes' ride from the theatre and shopping district. Every comfort—cool, refreshing breezes—smooth, sandy bathing beach—all summer attractions. Tourists and transients always find it a most attractive place to stop and rest. For Handsomely Illus. Booklet address Manager, 51st Blvd. and Lake Shore, Chicago

1 to 3 Miles per Hour Increased Speed Guaranteed

The Frontier Propeller is guaranteed to increase the speed of any boat or launch **from 1 to 3 miles per hour.** If it fails to do so, we will **refund your money.** Motorboatists who have tried all kinds of propellers, in search of increased speed, are enthusiastic about the wonderful results of the Frontier. Mr. W. S. Bryant, the designer, is the same expert who has been designing propellers, etc., for many years, and whose designs are famous. The Frontier is true pitch ¾ the length of blade. It is differential at hub, **thus overcoming all agitation** at that point. Gives a shearing cut from hub to periphery, allowing wheel to work full length of blade. Discharges water in tapered volume aft, thus affording all efficiency, less a small percentage of slip. Such results cannot be had from any other Propeller. Made of metal "as strong as steel." Fill in the coupon and mail it today. We will send you our chart of questions, to be filled in by you, so that we can determine the size and pitch of wheel best suited to your boat. **Your money refunded if the Frontier fails** to increase your boat's speed.

FRONTIER PROPELLER DETROIT

FRONTIER ENGINEERING CO.
826-846 Fort Street, W., Detroit, Mich.

FILL IN AND MAIL

The Frontier Engineering Co., 826-846 Fort Street, W. Detroit, Mich.

Send me your chart of questions, so that I can get more speed from my boat.

Name.....

Address.....